THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[Registered as a Newspaper.]

Vol. XXXII. No. 808.] LONDON, NOVEMBER 5, 1878. [30th Year.] Price 6d.

COOKE BROS.

See Page 685.

26, 27, & 28, FENCHURCH ST.,

LONDON, E.C.

GENUINE TORBAY PAINT
And SPECIAL GASOMETER PAINT.
Several Prize Medals. Established over 20 Years.
These Paints are now used in over 200 Country Gas-Works, and by all the London Gas Companies, on Gas-holders, Scrubbers, Purifiers, &c. Also used by the Admiralty, War Office, Railway Companies, Founders, &c. They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations; do not crack, blister, or flake off; will cover tar effectually.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov. 2, 1866.*
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BROOKFIELD GAS APPARATUS WORKS,
103, ICKNIELD STREET EAST, BIRMINGHAM.
CONTRACTOR FOR
LAYING MAINS
FOR
Gas, Water, & Sanitary Purposes,
AND MANUFACTURER OF
WOOD GRIDS
FOR
SCRUBBERS AND PURIFIERS.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a Prize Medal was awarded at the Great Exhibition of 1851, for "Gas-Retorts and other Objects in Fire-Clay," and they were also awarded at the International Exhibition of 1862, the Prize Medal for "Gas-Retorts, Fire-Bricks, &c., for Excellence of Quality."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Jos. Cowen & Co. are the only Manufacturers of Fire-Bricks and Clay Retorts at Blaydon Burn.

JOHN RUSSELL & CO.,
LIMITED,
Established at the commencement of Gas Lighting,
Manufacturers of
TUBES AND FITTINGS.
THREE PRIZE MEDALS,
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OLD PATENT TUBE-WORKS, WEDNESBURY.

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BELL BARN ROAD, BIRMINGHAM,
MANUFACTURERS OF
WET AND DRY GAS-METERS,
Licensees and Manufacturers of
HUNTS
PATENT COMPENSATING METERS,
STREET-LAMPS, &c., &c.
Established 1830.

THOMAS PIGGOTT & CO.,
SPRING HILL, BIRMINGHAM,
MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
Sugar, Saltpetre, and all kinds of Pans.
Roofs, Girders, and Bridges, and General Smith's Work.

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BUILDERS AND CONTRACTORS
FOR THE
ERECTION AND REBUILDING OF GAS AND WATER WORKS.
ESTIMATES FREE
FOR MAIN-LAYING AND GENERAL REPAIRS
RETORT-SETTING A SPÉCIALITÉ.
ROBUS'S IMPROVED RETORT-SETTINGS guaranteed to carbonize a large amount of coal with a small per cent. of fuel.
N.B.—All kinds of Fire Goods, &c., kept in stock for immediate delivery. Orders promptly attended to.
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DUKE OF HAMILTON'S
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CANNEL COAL.
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JAMES M'KELVIE,
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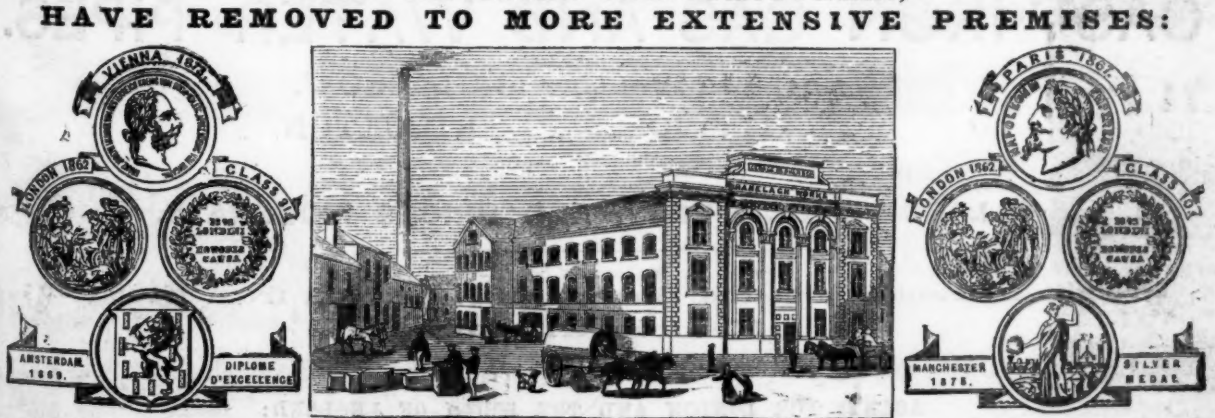
CHANGE OF ADDRESS.

GEORGE GLOVER AND CO.,
DRY GAS-METER MANUFACTURERS,
HAVE REMOVED TO MORE EXTENSIVE PREMISES:



RANELAGH WORKS, ROYAL AVENUE, CHELSEA, LONDON, S.W.

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MANUFACTURER OF

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EITHER BLACK, GALVANIZED, OR ENAMELLED HOT WATER TUBES AND FITTINGS,
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LAMBERT BROTHERS, WALSALL.

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Manufacturers of **W. J. WARNER'S PATENT MARKET GAS STAND-PIPE.**

Now ready, GAS CHANDELIER BOOK (Reduced Prices), 7s. 6d.

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Manufacturers of

IMPROVED CONSUMERS WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS.

And all kinds of Experimental Gas Apparatus.

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CAST-IRON GAS AND WATER PIPES.

SIZES: ¾ to 12 inches at GLASGOW.
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A LARGE STOCK KEPT, AND PRICES MODERATE.

Freight to London, in the Stream, 10s. per ton from Stockton; 15s. from Glasgow.

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WELLS, BIRCH, RYDE, and CO., Limited,

HOYLAND SILKSTONE COLLIERIES,

Near BARNSLEY.

This Company is now in a position to raise **2000 tons per day of REAL OLD SILKSTONE GAS COAL.**

"The quality of this Coal for Gas purposes, if equalled, is not excelled by any on record, and the Coke competes successfully with best Durham."—See *Mining Journal*, Aug. 11, 1877.

Prices quoted to any Railway Station, or F.O.B. Hull, Grimsby, Goole, Keadby, Liverpool, and Fleetwood.

Full particulars will be sent on application to above address.

IMPROVED HYDRAULIC CRANES,

Effecting a great saving in the cost of discharging Coals from Vessels, Barges, &c. Several of these Cranes, with the necessary power, are now being erected at the Beckton Gas-Works.

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HYDRAULIC RAMS for Lifting and Lowering Purifier Covers.

Sixteen now in course of erection at Beckton, applied to Covers 30 feet square.

GAS AND WATER PIPES, ROOFING, BOILERS, &c.

SULPHATE OF AMMONIA APPARATUS,

IN SUCCESSFUL OPERATION AT THE NEW WORKS OF THE NEWCASTLE AND GATESHEAD GAS COMPANY.

For particulars, apply to

JOHN ABBOT & CO., LIMITED,

2, SUFFOLK LANE, CANNON STREET, E.C., or PARK WORKS, GATESHEAD-ON-TYNE.

WEST'S GAS IMPROVEMENT COMPANY,

LIMITED,

ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS, H. & V.

And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.—INCREASED YIELD PER RETORT.—INCREASED BULK OF COKE FOR SALE.—REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to the Consulting Engineer, R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W., or to the Engineer and Analyst, F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

WILLEY & COMPANY,

GAS ENGINEERS,

WORKS: COMMERCIAL ROAD, EXETER,

INVITE THE ATTENTION OF GAS COMPANIES AND OTHERS FOR THE SUPPLY OF

EVERY DESCRIPTION OF GAS APPARATUS.

ENGINEERING DEPARTMENT.

NEW GAS-WORKS erected complete. Plans and Estimates furnished. MAINS, METERS, SERVICES, LAMPS, &c., adapted for Towns of any size. Gas Companies advised on Improvements, Extensions, and Alterations of Works.

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RETORTS and RETORT-HOUSE FITTINGS, CONDENSERS, SCRUBBERS, ENGINES and EXHAUSTERS, PURIFIERS, STATION-METERS, GOVERNORS, VALVES, &c.

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They beg special attention to the excellence and superiority of their WET and DRY METERS, several thousand being now in use by many of the largest Gas Companies in the West of England and South Wales. Warranted to measure correctly, and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured. A guarantee of Five years tendered with each Meter.

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An extensive variety of Choice Designs in CHANDELIERS, PENDANTS, BRACKETS, STAR and SUN LIGHTS, MEDIÆVAL FITTINGS for CHURCHES, &c.

PATTERN-BOOKS and PRICE LISTS furnished.

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GAS ENGINEERING WORKS, COMMERCIAL ROAD, EXETER.

GAS PURIFICATION

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OXIDE OF IRON.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.

JOHN WM. O'NEILL, Managing Director.

THE

STANDARD WASHER AND SCRUBBER.

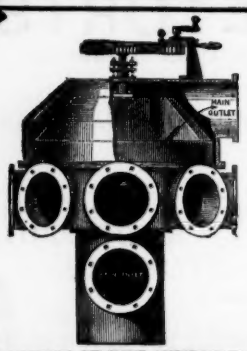
[KIRKHAM, HULETT, AND CHANDLER'S PATENT.]

Some of the advantages claimed for this Apparatus are as follow:—

The Exposing of a large Amount of Effectually-wetted Surface (which is continually reproduced) to act upon the Gas.
Unerring Regularity in the Distribution of the Liquor.
Saving of Expense in Providing and Exchanging Scrubbing Material—none being required.
Economy of Space, thus enabling the Apparatus to be protected from the Weather.
Economy of First Cost and of Maintenance.
It works without Pressure.
It is particularly adapted for Gas-Works where Sulphate of Ammonia is manufactured.

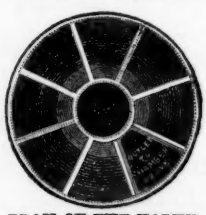
Applications for Prices, &c., to be made to

Messrs. KIRKHAM & HERSEY, GAS ENGINEERS, 21, ABINGDON STREET, WESTMINSTER.

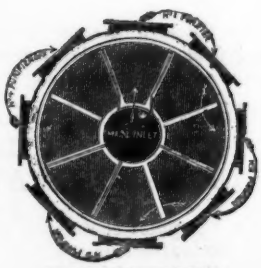


ELEVATION OF THE CENTRE-VALVE.

C. & W. WALKERS'
PATENT CENTRE-VALVES.



PLAN OF THE VALVE.



PLAN OF THE BODY.

These PATENT CENTRE-VALVES are the most perfect and certain means for working Purifiers on the system of three in action, and one out of action. The Valve itself is protected from all injury inside the safety cover. The working of the Valve is so easy, and so governed by the stop-catch movement, that the Purifiers can be instantaneously changed in the dark as well as in daylight. They are scraped perfectly true, metal to metal, the facings heretofore exposed are always covered, and there is nothing more reliable, certain, and durable in a gas-works. By their use the floor of the Purifying-house is clear and level; the Valve and all connexions being beneath the floor, out of the way of working. A considerable improvement and saving is effected in the cost of the connecting-pipes.

MIDLAND IRON-WORKS. DONNINGTON, near NEWPORT, SHROPSHIRE; 8, FINSBURY CIRCUS, LONDON.

EDWARD COCKEY & SONS,

GAS ENGINEERS, FROME SELWOOD,

MANUFACTURERS OF ALL DESCRIPTIONS OF

APPARATUS CONNECTED WITH GAS-WORKS.

THE ORIGINAL PATENTEES AND MANUFACTURERS OF THE

DRY-FACED VALVES

FOR PURIFIERS, GASHOLDERS, BYE-PASS, AND OTHER ARRANGEMENTS REQUIRING VALVES IN GAS-WORKS.

The Faced Valves, as made by the Patentees, continue to give great satisfaction, and they are being used extensively by many of the best gas engineers of the day.

They are more easily repaired than any other kind of Valve in use, and can be re-ground in a few hours without removal, and made perfectly gas-tight.

References can be given to many Engineers of high standing, who will testify as to the favour in which they are held.

MANUFACTURERS ALSO OF SUPERIOR WOOD GRIDS FOR PURIFIERS, SCRUBBERS, &c.

GEORGE ORME & CO.,

ATLAS METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET AND DRY GAS-METERS,

STATION-METERS, GOVERNORS,

PRESSURE AND EXHAUST REGISTERS,

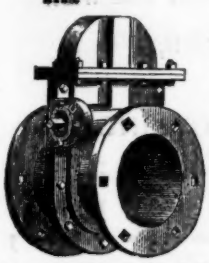
LAMP-METERS IN CAST-IRON BOXES,

And every Description of Gas Apparatus.

B. DONKIN & CO.'S

IMPROVED GAS-VALVES

WITH WROUGHT-IRON PINIONS.



List of prices, with full dimensions of all sizes up to 48-inch, to be had on application.

These Valves are proved on both sides to 30 lbs. on the square inch before leaving the works, and are kept in stock.

In ordering Valves, please state whether required for under or above ground, and if to be with flanges or spigots and sockets cast on, or with separate spigot and socket pieces.

ALSO SOLE MAKERS OF

J. BEALE'S NEW PATENT GAS EXHAUSTERS,

AND MAKERS OF

STEAM-ENGINES FOR DRIVING GAS EXHAUSTERS,

VALVES FOR AMMONIACAL LIQUOR,

IMPROVED BRIDGE VALVES FOR REGULATING THE SEAL IN HYDRAULIC MAINS,

BYE-PASS VALVES, SCREW WATER-VALVES, &c.

B. DONKIN & CO., 55a, BLUE ANCHOR ROAD, BERMONDSEY, LONDON, S.E.

J. & J. BRADDOCK,

GAS ENGINEERS,

GLOBE METER-WORKS, OLDHAM,

MANUFACTURERS OF

WET & DRY CONSUMERS GAS-METERS,

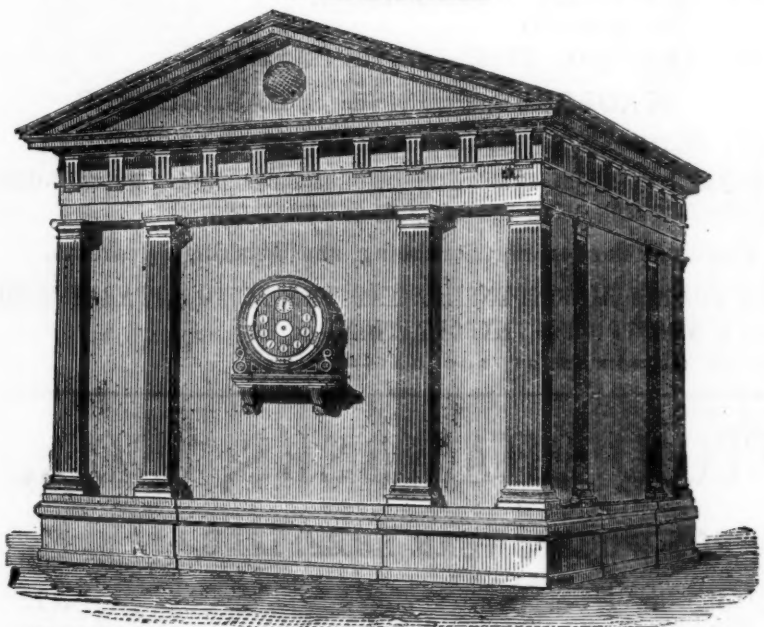
OF THE HIGHEST EXCELLENCE ONLY;

ALSO LICENSEES AND MANUFACTURERS OF

WARNER & COWAN'S PATENT SELF-REGULATING GAS-METERS;

ROUND STATION-METERS,

ON CAST-IRON STANDS.



SQUARE STATION-METERS,

WITH PLANED JOINTS.

GOVERNORS, GAUGES, INDICATORS, MAIN COCKS, &c.

GAS COOKING APPARATUS.

Home and Foreign Orders promptly attended to.

All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.

Orders almost invariably despatched on the day of receipt.

TERMS, &c. ON APPLICATION.

C. & W. WALKER'S

WOOD PURIFIER SIEVES,

Which have now been used for fifteen years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

MIDLAND IRON-WORKS,

DONNINGTON, NEAR NEWPORT, SHROPSHIRE.

FINSBURY CIRCUS, LONDON.

ESTABLISHED IN 1860.

BENJAMIN CARPENTER,

THE ORIGINAL MANUFACTURER OF THE IMPROVED

WOOD SIEVES

FOR

GAS PURIFIERS & SCRUBBERS.

PROVIDENCE WORKS,

22, HERMES STREET, PENTONVILLE ROAD

LONDON, N.

DEMPSTER & SONS'

RENOWNED

WOOD SIEVES,

WITH TAPER BARS,

MADE BY MACHINERY

CAPABLE OF MAKING 10,000 PER WEEKLY.

References to Hundreds of First-Class Engineers.

ROSE MOUNT IRON-WORKS,

ELLAND, NEAR HALIFAX.

JOHN ROMANS, C.E., F.G.S.E.,

CONSULTING GAS ENGINEER

AND

CANNEL COAL FACTOR,

30, St. Andrew Square, EDINBURGH.

Plans and Estimates furnished; Gas-Works, Apparatus, Pipes, Machinery, Fire Goods, &c., supplied, or Attested and Shipped for Exportation.

GAS-WORKS TAKEN ON LEASE.

MR. ROMANS has for upwards of 30 years been practically engaged in the Manufacture of Gas, and has, by extensive experiments, ascertained that by JUDICIOUS INTERMIXTURE of the lighter with the heavier gases, much of the rich Hydrocarbons CAN BE SAVED, which otherwise ARE LOST, during the process of manufacture. He is therefore enabled to give advice to those who favour him with their orders for Cannel, as to the class which will secure for their standard of illuminating power the HIGHEST ADVANTAGEOUS RESULTS.

ANALYSIS AND PRICES FORWARDED ON APPLICATION.

GRIRDROD'S PATENT

PORTABLE PIPE SCREWING MACHINE,

For ¼in., ½ in., ¾ in., and 2 in. Gas Threads, complete £7 10s.

In use at the chief gas-works, and giving great satisfaction.

For other useful goods, see Bailey's "Illustrated Inventions," post free 3s. 6d.; gratis to ledger customers.

W. H. BAILEY & CO.,

Brassfounders, Gauge Injector and Tool Makers,

ALBION WORKS, SALFORD,

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THOMAS TURTON AND SONS,

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SHEFFIELD,

MANUFACTURERS OF

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STEEL OF ALL DESCRIPTIONS,

SCREW STOCKS, TAPS, AND DIES, SPANNERS

RATCHET BRACES, LIFTING-JACKS,

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R. W. WINFIELD AND CO.,

CAMBRIDGE STREET WORKS AND ROLLING MILLS,

BIRMINGHAM.

The following Medals have been awarded:—

GRAND COUNCIL MEDAL, LONDON, 1851. MEDAL, LONDON, 1862. GOLD MEDAL, PARIS, 1867,

The only Gold Medal awarded for "Apparatus and Processes for Heating and Lighting" by the Imperial Commissioners

MEDAL FOR PROGRESS, VIENNA, 1873.

The following Medals were also awarded at Paris, 1878:—

GOLD MEDAL for Chandeliers and Gas-Fittings.

GOLD MEDAL (Rappel) for Metallic Bedsteads and Furniture.

GOLD MEDAL (Rappel) for Art Metal Work. BRONZE MEDAL for Tube Metal and Wire.

MANUFACTURERS OF BRASS AND COPPER SHEETS,

TUBE AND WIRE,

ROLLED METALS, LOCOMOTIVE AND CONDENSER TUBES, CYLINDERS;

Ornamental, Taper, and Cased Tubes; Tin Tubes;

GAS-FITTINGS, CHANDELIERS,

BRACKETS FOR HEATING AND LIGHTING;

METALLIC BEDSTEADS.

Ecclesiastical and Mediæval Metal Workers.

GENERAL BRASSFOUNDERS.

REGISTERED TRADE MARK:

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W. C. HOLMES & CO.,

WHITESTONE IRON-WORKS, HUDDERSFIELD,

MANUFACTURERS OF

RETORTS, ANNULAR AND PIPE CONDENSERS,

WROUGHT AND CAST IRON SCRUBBERS, PURIFIERS, GASHOLDERS,

GOVERNORS, AND ALL THE NECESSARY FITTINGS FOR COMPLETING THE ERECTION OF GAS-WORKS.

STATION & CONSUMERS WET OR DRY METERS, STREET & SERVICE MAINS, LAMP COLUMNS & BRACKETS, & WROUGHT-IRON TUBES AND FITTINGS; WROUGHT-IRON ROOFS FOR ANY SIZE OF BUILDINGS.

Sole Makers of B. W. Thurston's Combined Condensing, Scrubbing, and Washing Apparatus,

AND PATENTEES OF THE IMPROVED COMBINED CONDENSING AND PURIFYING APPARATUS SO EMINENTLY ADAPTED FOR EXPORTATION.

REFERENCES TO UPWARDS OF 300 GAS-WORKS.

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD,

MANUFACTURERS OF

IMPROVED CENTRE-VALVES,

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.

TANGYE BROTHERS AND HOLMAN,

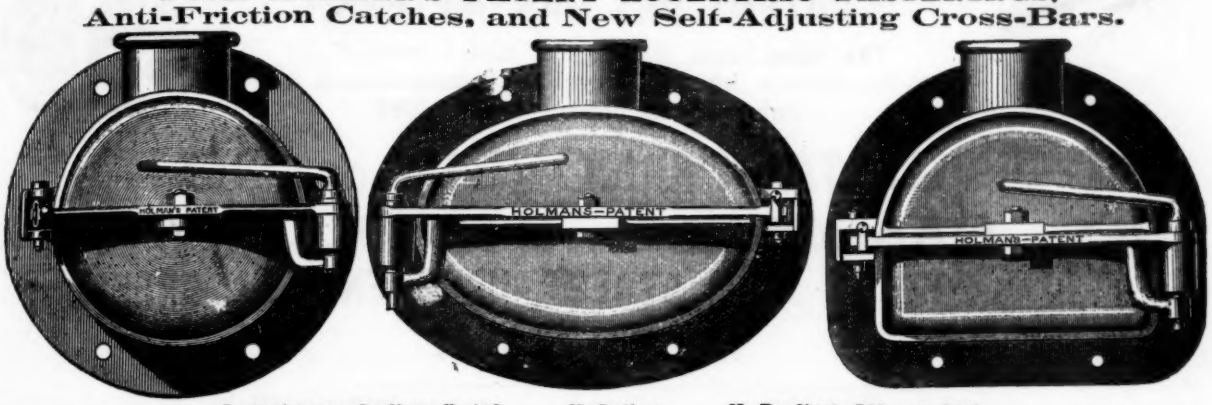
CORNWALL HOUSE, 35, VICTORIA ST., LONDON, E.C.

(LATE OF 10, LAURENCE POUNTNEY LANE.)

SOLE MAKERS OF MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT ECCENTRIC FASTENINGS,

Anti-Friction Catches, and New Self-Adjusting Cross-Bars.



Instantaneous Sealing effected. No Luting. No Duplicate Lids required.

Holman's New Self-Sustaining Cross-Bar ensures freedom of Joint, and maintains parallel position of the Lids.

Since their introduction in 1869, these Patent Retort-Lids have been thoroughly tested, being now in use in nearly all the principal Gas-Works in London and the Provinces.

T. B. and H. are now making the "Morton's Self-Sealing Lid" of the SAME FORM OR SECTION AS THE RETORT (see Illustrations above), as well as bringing the Mouthpiece from the D or Oval at back to Circular in front, as heretofore.

D and Oval Morton's Lids are working satisfactorily both in this country, on the Continent, and in the United States of America. Among others they have been adopted by the following Gas-Works:—

The Gaslight Company's Works, Fulham; Ditto, Bromley-by-Bow; Ditto, King's Cross; Ditto, Shoreditch.
And also in the Gas-Works at Richmond, Maidstone, Gloucester, Glasgow, Portsea, Roubaix (France), The Hague (Holland

HUNT'S PATENT EQUILIBRIUM GAS-GOVERNOR.

In this Governor a Throttle-Valve is substituted for the ordinary suspended Cone, all external communications being avoided by placing the Lever or Radius Arm (shown in the drawing) inside the Valve-Chamber upon the Disc. The Disc is carried upon steel centres, upon which it is accurately balanced and turns freely. The friction in working is thereby reduced to a minimum. This Governor is extremely sensitive to alterations of inlet or outlet pressure, and renders a large actuating holder unnecessary.

The principal advantages of this arrangement over the ordinary form of Governor are as follows:—

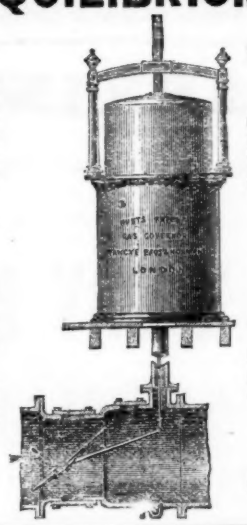
Its sensitive action prevents oscillation.

It is self-adjusting—*i.e.*, it maintains a steady pressure under variations of inlet pressure or a fluctuating consumption.

The inlet to Gasholder being contracted to the smallest possible dimensions, all danger from leakage through insufficiency of seal, tilting, &c., is entirely avoided.

The valve portion being separate from the holder, it can be handled and fixed like an ordinary Slide-Valve direct in the main; and the holder can be placed at an convenient distance immediately above it. The cost is thus materially reduced, and the inconvenience of heavy lifts done away with.

There are no working parts likely to get out of order.



These Governors have been adopted by many leading Gas Companies, among whom are the following:—

The Gaslight and Coke Co. (9), The London Gas Co. (3), and at Abergavenny, Arundel, Birmingham, Cannes (France), Devonport, Dursley, Exeter, Guernsey, Halesowen, Mentone (France), Monmouth, Newcastle-on-Tyne, Oxford, Plymouth, Rochdale, Windsor, &c.

TESTIMONIAL.

The Gaslight and Coke Company,
9, Water Street, New Bridge Street,
Blackfriars, E.C., Feb. 27, 1875.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—The two 24-inch and three 36-inch Hunt's Equilibrium Governors supplied by you, and fixed in the valve-rooms at Whitechapel, Goswell Road, and Blackfriars, are working very satisfactorily.

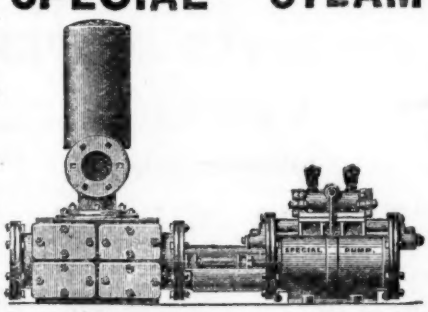
Yours truly,

(Signed) JOHN JOHNSON.

PRICES AND FULL PARTICULARS ON APPLICATION.

THE "SPECIAL" STEAM-PUMP.

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons of Water per Hour, Approximate.	Reduced Prices.
3	1½	9	450	£16
4	2	9	815	18
5*	2½	12	1,250*	20
5*	3	12	1,830*	22 10
4	4	12	3,250	25
6*	4	12	3,250*	30
5	5	12	5,070	32 10
7*	5	12	5,070*	40
6	6	12	7,330	40
8*	6	12	7,330*	50
7	7	12	9,750	50
10*	7	12	9,750*	65



In use in a Hundred Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.

Messrs. Burt, Boulton, and Haywood, Manufacturing Chemists, have over FORTY "Special" Steam-Pumps in use at their several large Tar-Works.

Two Hundred Sizes made. Those in Table opposite are the leading Sizes for use in Gas-Works and Chemical Works.

* These Sizes being usually selected for pumping Tar and Liquor, are always in stock, or nearly ready, fitted with all pump details in iron, and extra length distance-piece between steam and pump cylinder, at a small extra cost.

TANGYE'S HIGH-PRESSURE AND CONDENSING STEAM-ENGINES; CORNISH, VERTICAL, & TUBULAR BOILERS; HYDRAULIC AND SCREW LIFTING-JACKS, CRABS, PULLEY-BLOCKS, &c.

FULL PARTICULARS, ESTIMATES, CATALOGUES, ETC., ON APPLICATION.

London, 1851 New York. 1853. Paris, 1855. London. 1862.

Dublin, 1865.

The SIX MEDALS AWARDED to THOMAS GLOVER for

PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

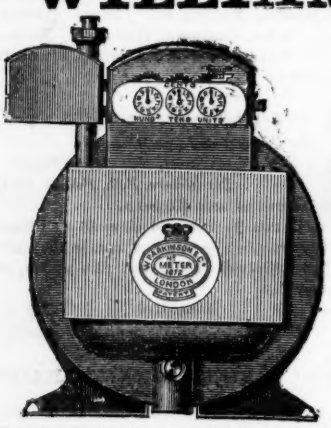
214 TO 222, ST. JOHN STREET, CLERKENWELL GREEN,

LONDON, E.C.

THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
2nd, Are suitable for all climates, whether hot or cold;
3rd, Incur no loss of Gas by evaporation;
4th, Cannot become fixed by frost, however severe;
5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
7th, May be fixed either above or below the level of the Lights;
8th, Cannot be tampered with, without visibly damaging the outer case;
9th, Will last much longer than Wet Meters;
10th, Will not cost more than one-half for repair that Wet or Water Meters do;
Are upheld for five years without charge.

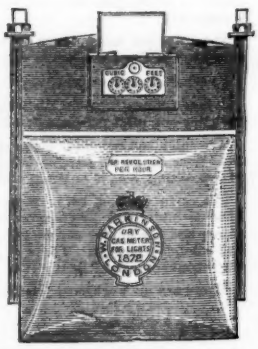
WILLIAM PARKINSON AND CO.,



(ESTABLISHED 1816,)

MANUFACTURERS OF

WET & DRY METERS,



STATION-METERS & GOVERNORS,

EXHAUSTER REGULATORS,

PRESSURE REGISTERS, EXPERIMENTAL APPARATUS, GAUGES, WATER-METERS, &c

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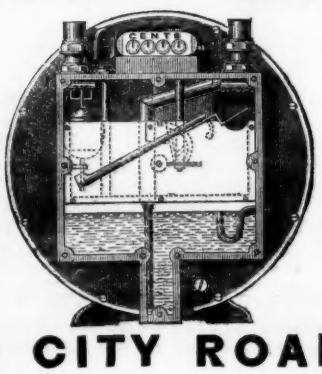
HUNT'S PATENT IMPROVED COMPENSATING METER.

In this Meter, the action of the measuring-drum is reversed. By this arrangement an improvement is effected in the registration at high speeds, which, in many tests, has not varied from the smallest light to three times the capacity of the meter. It works equally well under all pressures. The range of error between the high and low line is much smaller than that allowed by the "Sale of Gas Act."



The Meter has been critically tested, and most favourably reported upon by official Meter Inspectors in London and Birmingham.

W. PARKINSON and CO. have made arrangements for the manufacture of these Meters, both in tin and cast-iron cases, and for the alteration of old ones to this principle, which is confidently recommended as possessing every quality that can be desired by Gas Companies, Corporations, or Private Consumers.

COTTAGE LANE, CITY ROAD, LONDON, E.C.

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TO CORRESPONDENTS.

Until arrangements, consequent upon the recent death of Mr. William B. King, are made, all communications for the Editor, remittances and orders for subscriptions and advertisements, &c., should be addressed to Walter King, 11, Bolt Court, Fleet Street, London, E.C.

WEST OF SCOTLAND ASSOCIATION OF GAS MANAGERS.—*We regret that, through an unavoidable cause, we are compelled to postpone till next week the continuation of the report of the proceedings at the last meeting of this Association.*

RECEIVED.—*G. Gale, Leeds; J. Somerville, Kilkenny.*

We may again remind our readers that letters arriving later than Saturday cannot, as a rule, be inserted in the next issue.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 5, 1878.

Circular to Gas Companies.

SOME able remarks on the subject of the electric light were made, in a recent number of *Mayfair*, by a gentleman who has evidently studied the matter. The writer agrees with us in saying that the actual cost of the light is not yet known, and, therefore, no comparison can be made of the relative cost of gas and the new illuminant. We know the cost of the former to the fraction of a farthing; but we shall probably never be able to ascertain the exact cost of the latter. The writer, we notice, makes one good point, which is not altogether novel, but has not been sufficiently insisted upon. A consumer has gas in his house—let us hope in every room. He does not want it in the bedrooms in the daytime, and in the evening he only requires it in the apartment he is occupying. All that is necessary to keep him supplied with the quantity of gas which is needed is to turn on or turn off a few taps; but what would happen if he were supplied with an electrical current? He must have currents sufficient for the whole circuit of lights, or let them all go out. How far it may be possible to distribute electricity from a great centre, as has been proposed in Liverpool, we will not undertake to say; but with our present knowledge of the state of electrical science, it would be necessary, if a branch wire were carried into a house, and a number of other branch wires were taken to the different apartments, that the same amount of force should be expended in supplying one light as would be wanted for the whole system. What the inventors, whose names we mentioned last week, have done in the way of subdividing a current, we do not know; but, taking the simplest view of the matter, so far as we understand it, the arrangements for domestic lighting must be of a most complicated character, quite beyond the powers of servants, or even householders, to control.

A veteran in the art of gas-making, and a scientific man as well, has favoured us with his views on "The Electric Light "and Lighting by Electricity." We publish the communication mainly to show how the matter is regarded by a gentleman with Mr. J. O. N. Rutter's interests and responsibilities. He has evidently no fear that the electric light will, for a very long time, come into serious competition with gas. What a distant future may bring forth no one can say. When coal becomes a scientific curiosity, the illimitable amount of electricity which may be developed with the assistance of mechanical force may be utilized to produce some of the effects now brought about by the combustion and distillation of coal. The sources of force are manifold, and the engineers of the "coming race" will find no difficulty in driving dynamo-electric machines without the aid of coal.

It might have been expected that the patent roll would be largely extended by specifications for improvements in the production of the electric light. Last week we had to record several new applications for patents, the significance of which cannot at the present moment be ascertained; but two gentlemen are found amongst the applicants, who are certain to have some invention of importance in hand. Dr. Siemens and Sir C. T. Bright are two of the most prominent men amongst modern electricians, and we shall wait with curiosity to learn what they have done and what they propose to do. Mr. Pulvermacher has a name as an electrician; but whether he intends to illuminate the interior of the human body, or light up our streets or houses we do not know. It does not matter—the field is wide; ingenuity is unbounded, and, to use a somewhat vulgar expression, we may say of electric inventors, the more the merrier.

The Corporation of Liverpool are seriously exercising themselves on the question of electric lighting. They have, rather late in the day, directed their Engineer and Borough Surveyor to report on the modes of electric lighting adopted in Paris, and also to confer on the subject with the Chief Engineers of the Metropolitan Local Authorities. They also propose to promote a Bill in the next session of Parliament to enable the Corporation to light the streets and buildings of their borough by electricity. There is a question about the source from which the money to pay for this application is to come. There is also, we fancy, a desire to avoid, if possible, an appeal to the ratepayers under the Borough Funds Act; but we are happy to see that leading members of the Town Council are opposed to any such evasion. We shall be curious to see in what terms the first Bill, to enable a Local Authority to supply electricity for illuminating purposes, will be drawn.

After four years of unparalleled exertions, Dr. Cross, if we understand the matter rightly, relinquishes the Chairmanship of the Gas Committee of the Liverpool Corporation. He promised great things, but none of them have been realized. The United Gaslight Company still exist, and are more flourishing than ever. They have no fear of competition with the Town Council, as purveyors of the electric light, but will plod on their way, at ten per cent., with continued prosperity.

The same may be said of the Corporation of Manchester, who seem to be in no hurry to deal with the electric light question, but will quietly proceed in extracting £50,000 a year from the pockets of the gas consumers for improvement purposes, and pretending that this is not a rate. So far as we can see, the Town Council of Manchester do not propose to take any steps to obtain statutory powers to supply electricity for illuminating purposes According to one member, they will wait to see what Liverpool does, and watch the results. The cases of the two cities are perfectly distinct. In the one, there is a Company supplying excellent gas at as low a charge as could be expected; in the other, there is a powerful Corporation furnishing gas at a price which cannot be commercially justified. The Corporation of Liverpool may be quite right in entering into competition with the Gas Company, but the Corporation of Manchester will think twice before they propose to supersede gas by electricity.

Persistent attempts are being made to write down the value

of gas property. The daily papers teem with letters which, if their contents could be thoroughly appreciated by the Editors, would never be inserted. Some of them spring from the minds of ignorant people; others are, unfortunately, emitted by malevolent writers. We notice one contributed by a gentleman who ought to have known better. His suggestion is that, to compete with the electric light, Gas Companies should content themselves with a five or six per cent. dividend. Does he think for one moment what this means to investors who paid, say, £200 for Commercial or Chartered stock? It is not possible at present for Gas Companies to reduce their profits; they must maintain them at their present rates, and, wherever possible, increase them. The interests of investors who have paid very high premiums have to be considered.

We have received the statement of accounts of the gas department of the Burnley Corporation, from which we gather that the sum of £6046, representing the profits of the year, has been carried to the borough fund account, for the reduction of rates. It is fair to mention, however, that the Council have resolved on reducing the price of gas from 3s. to 2s. 6d. per thousand feet. Our readers well know the opinions we entertain on the application of gas profits to public purposes. We should not have alluded to the subject here, but for the fact that we find all the views on the subject expressed in this JOURNAL supported by such an eminent authority as Mr. Michael, Q.C. In the first place, this gentleman is strongly opposed to the transfer of undertakings from Companies to Local Authorities. With the eye of an economist, he looks with something like dismay upon the diminished opportunities the public have of investing money for profitable uses; and he fails altogether to see that any good accrues to a community by the transfer of a gas or water undertaking to a Local Authority. What, as we have often urged, a Corporation can do a Company can do just as well, and often better. Then he is quite opposed to the making of profits to be applied in aid of rates, or to build town halls. The object of a Corporation should be to supply gas at as cheap a rate as possible, even at cost price. We can hardly go this length, for we think a depreciation or renewal fund a justifiable appropriation of profits; but there we stop. We are sorry Mr. Michael did not allude, in express terms, to the Scottish system, which exactly carries out his and our views. Under this, the price of gas is fixed after a careful estimate has been made of the expenses of the year; and it is calculated so as to exactly cover those expenses. In some cases we have noted that the revenue has very closely balanced the estimated expenditure. Of course, if a deficit occur, it can be made up in the subsequent year; if profit be made, it is instantly applied in a reduction of price. That is the system under which we think all Corporation gas undertakings should be managed. We may here express our hearty concurrence with Mr. Michael's views, and thank him for his powerful advocacy of opinions we have always put forth. His able Address, delivered before the Health Section of the Social Science Congress, will be found in another column.

The Town Council of Exeter are rather hesitating about the purchase of the Gas Company, and we fancy it would require but little trouble to frighten them from proceeding with further negotiations. The opinion of the ratepayers and owners in the city has to be taken, under the provisions of the Borough Funds Act, 1872, before the necessary Purchase Bill can be proceeded with, and we are not in a position to form a judgment as to how far the Town Council will be supported in their plan. If, in the end, the Company should be left in the peaceful possession of their property, we shall not regret it, and certainly should not think of advising an application to a Court of Equity to enforce the completion of the purchase.

We omitted last week to notice the valuable and practical address of Mr. S. Stewart, the President of the West of Scotland Association of Gas Managers. He made but a brief reference to the Aitken and Young process, which appears to be coming more and more into use in Scotland. In another column we publish a letter from Mr. Aitken, giving an account of some experiments made with ordinary gas coal, and the results certainly look remarkable. West Leverson coal, under the patented process, yielded 10,640 feet of 19·09 candle gas. Mr. Stewart referred to the opinion commonly entertained, that the value of the tar would be depreciated if the process were commonly employed—an opinion which we share; but it might be otherwise. Naphtha is a necessity for some manufactures. We should have no aniline dyes without benzole, for at the present moment we see no source of benzole but coal tar. It may then happen that tar may not be depreciated in value, if the greater part of the benzole be put into the gas.

The question as to whether or not London should be supplied with rich cannel gas, is raised by a correspondent in another column. We should deprecate the re-introduction, on two grounds. First of all, we think that gas of from sixteen to seventeen candle power is quite sufficient; and then it is essential that the Metropolis should have a supply of good and useful coke. What is the best thing to do, in order that gas may compete successfully with the electric light, is not difficult to see; but there is plenty of time to consider the question.

We are sorry that, when alluding, last week, to the published accounts of the British Gaslight Company, Limited, Staffordshire Potteries Station, it escaped our memory that the form is prescribed by the Staffordshire Potteries Act, 1866. We have nothing to recall, for we entirely object to the form; but we are anxious to point out that it is one made obligatory on the Company by statute.

Water and Sanitary Notes.

THE very able and interesting Address which Mr. Michael, Q.C., made to the Public Health Section of the Social Science Congress, will be read with pleasure by all our subscribers. It is not always that a gentleman who has had Mr. Michael's scientific training, and, moreover, his experience as a parliamentary lawyer, is found in the position which this gentleman has recently filled. The designer of the City of Hygeia may not be exactly a dreamer, but he is a man of very few ideas, and hardly capable of appreciating public matters as they stand. Mr. Michael is a man of a very different stamp, with a knowledge of all that has been done, and all that can be legally accomplished now. He has sufficient scientific and legal acumen to know what it is necessary to do in the future. He sees with perfect clearness where the defects of our sanitary laws lie; it is in the absurd subdivision of jurisdiction, against which this JOURNAL has always protested. If any great sanitary measure, which will be really useful to the community, is to be carried out, it must proceed upon lines altogether different from those which have guided present legislation. What, for instance, can be more absurd than the distinction between urban and rural districts? of which Mr. Michael, had he been a man of humour, might have made so much fun. He has, perhaps, the happier distinction of being a man of fact, and here is the deliberate opinion which he expresses:—"A reconstitution of the boundaries of districts "within which Sanitary Authorities exercise control, is the first "requisite to ensure a thorough amendment of the public "health." It has been continually urged in these columns that nothing can be effectually done, in the improvement of drainage, water, and gas supply, until our units of area are altered in accordance with the facts of physical geography.

The Corporation of Liverpool, having relinquished the idea of going to Parliament this year for a grand scheme, are quietly watching the results of the new boring at Bootle well. Whether or not Alderman Bennett sits beside the hole all day long we cannot say, but he evidently attends to the experiment with the greatest closeness. He still entertains a hope that water may gush up at Bootle, and that the level may not sink after a few months pumping. We are sorry we cannot support the worthy Alderman's honest views. Additional water may be obtained from the Bootle well, but it will only be at the expense of other borings. The wells in the new red sandstone all communicate, and if much water is pumped from one, the level necessarily sinks in the others. The water in that stratum is not there, as some suppose, in an inexhaustible quantity. If we knew the exact area, the amount of water to be got out of it might be easily calculated; but, in the absence of exact knowledge, we must attend upon experiment, and therefore await the result of additional borings.

So far, nothing definite has been done with regard to the disposal of Glasgow sewage. The small local authorities whose districts are implicated shrugg their shoulders and decline for a time to unite with the Corporation of Glasgow in doing the work which before long must be undertaken. It is the way of small local authorities, who always shirk work as long as possible. In this case, however, the duty of purifying the Clyde and affluents is so imperative that we are quite certain the Government will not allow the matter to rest as it now stands. We will not say that the plan which finds most favour with the Corporation of Glasgow is the best that could be devised; but there is this much to be said, that its execution at no great expense, with such resources as the city of Glasgow and neighbourhood have, will not prevent the profitable utilization of sewage at some time to come.

The Corporation of Durham have not yet settled on the source of their future water supply. At this moment they are awaiting the action of the Weardale and Shildon Water-Works Company. We believe that this Company have every reason to

be satisfied with the supply for their present district; but additional works must necessarily be constructed when they have to provide water to the City of Durham and its surroundings. The Corporation of the city have called in Mr. Mansergh, C.E., whose report has not yet come to hand. It seems to be doubtful whether anything will be done this year. The citizens of Durham will most likely go on for a long time drinking the water of the Wear, and we venture to predict they will be none the worse for it. A number of them may, perhaps, be very ill when a change is made.

The members of the Town Councils of Stockton and Middlesbrough have paid a visit to what were once the pumping stations of the Stockton and Middlesbrough Water-Works Company. They were exceedingly gratified by their visit, inasmuch as the Mayors of the boroughs invited them to a substantial luncheon. There is evidently no thought of providing any other source of supply than the water of the Tees. It will be remembered how much this was abused when the dispute with the Company was progressing, but we ventured to predict that if the undertaking fell into the hands of the Corporations, the inhabitants of Stockton and Middlesbrough would still be supplied with the "much abused" water of the Tees. Our prediction is being fulfilled; there seems now to be no thought of changing the source of supply. As we said in the case of the supply of Durham from the Wear, the inhabitants of the two boroughs we now refer to will be none the worse in health from a continuation of the supply from the river if the water be properly filtered. There are large beds, and we read of the use of strata of sand of unusual thickness. With these precautions, Tees water will do very well, and not poison the inhabitants.

Abingdon claims to have a sewage farm that pays. We do not exactly see it. The farm unquestionably makes a profit on the actual outlay for works and labour, &c., but the deficiency is very considerable when the Committee have to make up the interest for expenditure. It is, after all, not an encouraging instance, and towns should examine the accounts very closely before they go into sewage farms on the strength of the experience acquired at Abingdon.

Communicated Article.

THE ELECTRIC LIGHT AND LIGHTING BY ELECTRICITY.

By Mr. J. O. N. Rutter.

Part I.

What has of late been said about the electric light, some has been well said and some ill said. When so many opinions are expressed, it is not likely that all will be right; a great deal more is sure to follow. Respecting that, we must exercise patience. All is not projected that will have to be realized. Nothing great, unexpected, and really valuable can be achieved without enthusiasm. When all has been done which can at present be done, there will be abundant opportunities, by efflux of time, for getting back to quietness.

Looking at electrical lighting in its relations to gas lighting, I know of nothing to warrant the expectation that one will put out the light of the other. Nor will there be that kind of competition which is predicted. The electric light will have a special sphere for its operations, and, whilst doing a great deal in that sphere, is not likely to obtrude injuriously upon the already occupied sphere of gas light. Long, long ago I had no doubts that the electric would be *a* light, but not *the* light, of the future. When that would happen—the distance or nearness of the event—no one could guess. Changes, very wonderful changes, in the aspects of electrical lighting are not only impending, but declaring their accomplishment; and their approach has been quicker than was generally anticipated. All this notwithstanding, and also the glib talk about the days of gas companies being numbered, there need be no fear that gas lighting will not hold on its way. In one sense its days are numbered; but the number is very great. Why do not the prophets quote the exact number?

There are many who are well skilled in gas-making, and very many more connected with the sale and management of gas, who are not likely to be familiar with the phenomena of electricity. I have thought it might be desirable to try my hand, in a very plain way, at giving such persons a little information on the subject.

The question asked hundreds of times is: "What is the electric light?" Here is the old story; easy to ask questions, difficult to answer them. In this case, the only plain and exact answer is: "The electric light *is* the electric light." So, again, another question might be asked: "What is electricity?" Can any other reply be given than that "Electricity *is* electricity"? No wonder if such replies appear to be curt and unsatisfactory.

Instead of asking, "What is electricity?" suppose the question be: "Where is electricity?" So far as our knowledge extends, the answer to that is plain; for it is believed to be everywhere, and we are not able to think of any place within the boundaries of this world where it is not. Electricity is, by means of suitable instruments and apparatus, made to reveal itself as penetrating, or surrounding, or diffusing its marvellous properties in all kinds and forms of material substances, and in living organisms; and, whilst seeming to be an integral part thereof, it is in reality separate and distinct.

Frictional, or, as sometimes called, common, electricity, is that produced—and yet not produced, but only accumulated and made apparent to the senses—by an electrical machine, emitting sparks; and, when a Leyden jar or battery is used, a powerful shock and brilliant sparkles of light. This kind of electricity all persons may be supposed to know something about. It is the same as lightning which precedes thunder.

Galvanic or voltaic electricity depends upon chemical action by dissimilar metals, mineral acids, and many other kinds of materials which are used in the departments of telegraphy. By these means a brilliant light can be obtained; but not sufficiently steady and continuous for lighting purposes.

Electro-magnetic electricity—what does that mean? Making a bar of iron into a temporary magnet, possessing all the properties of a steel magnet. This is done by putting a voltaic current along a coil of copper wire, within which is placed a bar or horseshoe-shaped piece of soft (malleable) iron. So long as the current is passing, the magnetic properties continue. When it ceases, what was a magnet becomes again a piece of inert iron.

What might not improperly be called vital electricity is that which is known to influence, and is associated with, the bodily functions. It is wrong to say that life is electricity, and equally wrong to say that electricity is life. It is not possible to believe that life can be sustained without it; but how it operates and what are its conditions as respects strength and weakness, health and disease, it is best to confess ignorance. Nothing is more certain than that what is called common electricity is emitted by the human body, and so also that which exactly resembles the voltaic current is set in motion, its effects made visible, and its force measured by the voluntary tension of certain nerves and muscles.

Much as is known of electricity, there are some outlying districts which have to be explored. Judging by the knowledge and experience already acquired, it is certain there is more to know and more to do. Never, for practical purposes, was such knowledge, and its right application, more urgently needed than at the present time.

We know that electricity is inseparably connected with heat, with light, with air, and all aëriform bodies (gases); that it is present in vapours, in liquids, in all solid substances with which we are acquainted, and, as there is reason to believe, in everything which has life, from the tiniest insect to the largest animal. Whether it is diffused through illimitable space or only a few miles above us, whether it penetrates through and through the globe or only a few miles or thousands of yards below its surface, are matters which may be thought about; but to such inquiries we get no response. But although within the range of our observations it is thus universally diffused, it is under the control of laws. By a knowledge of some of these laws it has been subjected to management; and so it is sent on a journey of thousands of miles to convey a message, and when, by powerful machinery, forced to pass in great quantities and very quickly through a few yards of wire, it changes darkness into what is very like daylight.

In a few words I must refer to some of the laws of electrical phenomena. It will pass freely, and, so to speak, instantly, along or through (we are not sure which it is) all kinds of metals, some more readily than others; but it will not do so with (dry) wood, with glass, or silk, or resinous substances. The substances by which it has a free passage are called conductors, the others non-conductors. An intermediate class are said to be imperfect conductors. Air is comparatively a good non-conductor when dry, very imperfect when moist. So also glass loses much of its non-conducting properties when covered with moisture. Water is a conductor, and so is steam. When two substances are so placed—one a conductor, the other a non-conductor—that the latter be a protection to the other, the conductor is said to be insulated; the object being the prevention of the escape of the electricity with which it is charged. For this reason the wires used in telegraphy and other electrical operations are covered with non-conducting substances.

There is another law. It is invariable and unalterable, and not affected by any external influences. This relates to opposite states or different properties of electricity. They are called positive and negative; but they are names only. Upon the relations subsisting between different qualities or different conditions, whatever they may be, and the effects produced by their separation and coalition, all the phenomena of electricity, as at present known, may be supposed to depend.

Turning back to the description given of electro-magnetic electricity, it will be seen that by passing a current along a coil of copper wire, which surrounds a piece of soft iron, the iron immediately becomes endowed with the properties of a properly-made steel magnet, permanency excepted. On stopping the flow of electricity, the so-called magnet becomes what it was before.

It is not necessary to describe the properties of permanent magnets, nor the way by which their properties of attraction, repulsion, and polar direction are imparted. We know it is done; and if it be asked why steel retains magnetism and iron does not, the only answer is, "Don't know." The fact is known, and it is a very old fact—especially polarity, as in the mariner's compass. This was practically known many hundreds, and probably thousands, of years before the affinities between electricity and magnetism were discovered.

Now we must think of other forms of apparatus in which a voltaic current is not employed. Instead of making soft iron enclosed within a coil (helix) of covered wire into a magnet in that way, the arrangements are reversed. Here the work before assigned to the

voltaic battery is done by the magnet; the soft iron and its appendages being set rotating in front, at the sides, or between the poles of the magnets. The magnets are stationary, and the rotating iron is converted into an electro-magnet. This is called magneto-electricity. By its means the electric light, as well as the other phenomena of electricity, are elicited. Here the aid of another power has to be engaged—mechanical force, a steam-engine being the motor.

At Florence, in 1832, the discovery was first made that a spark—the electric light in miniature—could be obtained from a natural magnet (loadstone). This soon led to other methods of manipulation and forms of apparatus. In 1833 the spark was shown in this country. This was done by operating with steel magnets and a rotating (soft iron) electro-magnet, the spark being emitted at every break of the circuit. By that machine, which a child could set in motion, a spark, a shock, and the decomposition of water were obtained, and (by induction) another electro-magnet. Since the first recognition of this new phase of electrical science (46 years), there have been improvements in apparatus, or rather in magneto-electric machines, some of which are so large and costly, that it sets us thinking about difficulties and failures in proof that the interval has been so great between discovery and practical application. Discouragement does not mean defeat. There now appears to be a sudden awakening. New ideas, new forms of manipulation, more powerful machines, and the correctives by knowledge and experiences already acquired, are more likely to be successes than failures. If magneto-electricity be capable of yielding a steady, continuous, pleasant, and not too costly a light, it will do it. It is beyond doubt that means will be devised for such a distribution as shall adapt it specially for special localities and purposes. What there may be beyond and in addition we can wait for patiently.

What about the motions of the machines employed in magneto-electricity? To fit them for their work they must be made of the best materials, and constructed with such skill as to be as nearly as possible perfect. When we think of the rapidity with which the electro-magnetic portion of the machines revolves, it seems to take one's breath away. Eight hundred revolutions in a minute—13 times during each beat of a seconds pendulum—is not an extraordinary rate of speed. There are smaller machines which have revolved at the rate of 1100 times in a minute.

Of electricity, whatever its properties, or the names by which it is designated, it must be said that it is not made—not produced. It already exists; and so there can be said of it what is not to be said of any other light-producing materials at present known—that the supply is inexhaustible. For candles, for lamps, for gas, the materials employed in producing light are not replaced and not recoverable. As respects coal especially, it is well known that the place it occupied is not re-occupied by the same kind of material. Not so with electricity. Use as much of it as we may, there is no waste, no loss, no deterioration—as much remains after we have done as before we began. Whatever kind of work it is set to do, if our part be properly done, electricity will do its part well. The world is full of it. Only the proper appliances and good management are required, and it will

"Put a girdle round about the earth in forty minutes,"

and when that is done it is neither wearied nor is it unwilling to do the same again, or something equally or more difficult.

How is light obtained by electricity? By powerful machinery, as already mentioned, it is gathered and dispersed. By thus gathering and dispersing in great quantities, and compelling it, during the process, to leap across a very narrow space between the conductors where carbon points are fixed, it makes itself visible, and more or less brilliantly in proportion to the quantities and attendant conditions.

The light can be obtained. No one doubts that. The need now is to get it under control; to subdue and to modify its extreme intensity, and so to regulate it as that it may do what we require without waste. We want to make it not only to subserve our conveniences, but to be a pleasant companion, steady, quiet, manageable. Lighting by electricity must next be thought about.

Black Rock, Brighton, Oct. 30, 1878.

Correspondence.

[*We do not hold ourselves responsible for the opinions expressed by Correspondents.*]

THE ELECTRIC LIGHT.

SIR,—In reply to numerous applications made to me respecting this light, I have said that, with your permission, I intended to make a few observations, in your next issue, as to the practicability of its being used as a substitute for gas, for the general purposes to which gas is now applied. I have not been able to get them ready in time, and must, therefore, defer the matter until next week.

W. LIVESEY, Secretary.

Gas and Water Companies Association, 6, Victoria Street, Westminster, Nov. 2, 1878.

ACCOUNTS OF GAS COMPANIES.

SIR,—Having been, during the whole of my professional career as a public accountant, and for many years previously, engaged in making up, remodelling, and balancing the accounts of gas companies, as well as preparing statistics for parliamentary and arbitration proceedings, I think I may be allowed to speak, not only upon the principles upon which the science of book-keeping is based, but also upon the form of accounts specially adapted to meet the requirements of gas companies; and, referring to the letter in your issue of Oct. 22, signed "William Doré," I find that the Chepstow gas accounts have been sent to you "as a contribution upon the question as to the proper form of presenting gas-works accounts, and as representing the working of a small gas company;" and on reference to page 600 of the same issue, I find set out the "proper form of presenting gas-works accounts."

On reading the letter, my curiosity was considerably excited, and I lost no time in studying the "proper form;" but, after I had done so, I must confess to a feeling of great disappointment; and when I began to compare the proper form with that prescribed by the Gas-Works Clauses Act, 1871 (which may, for the sake of brevity, be called the "parliamentary form"), I felt almost bound to come to the conclusion, that the author of the proper form either did not know of the existence of the parliamentary form, or that he entirely ignored it. It may, however, be noted, in passing, that the parliamentary form was not the creation of a moment, nor yet the invention of one mind only, but that, before it received the support, and ultimately the sanction of the Legislature, it underwent a severe and thorough sifting process.

To come more closely to the subject, I think there are three points to be considered:—

1. The requirements to be met by a form of account.
2. Whether the parliamentary form meets the requirements of gas companies.
3. Whether the proper form is more adapted to meet those requirements than the parliamentary form, and therefore entitled to take precedence thereof.

As to the requirements to be met by a form of account, the first problem an accountant seeks to solve, in making up the accounts of any trading or manufacturing concern, is (after having thoroughly ascertained the nature of the business) to settle the headings or names of the revenue accounts (which must possess both adaptability and comprehensiveness), and then to arrange the same in the most logical and convenient order. And when we consider the nature of the business carried on by gas companies, and the peculiar requirements of their accounts, it appears to me that the parliamentary form is admirably adapted to meet the same, and that the arrangement or order thereof is both logical and convenient, and embraces broad, intelligent, and yet simple and effective lines. But what do we find when placing the proper form by the side of the parliamentary form? Why, just nothing but a species of mystification, and a peculiar jumble of manufacturing charges with those of distribution and management, the whole being void of either design or point.

I should not, however, have troubled you with this letter if the fundamental principles upon which the science of book-keeping is based had not been violated in the proper form with which the public have been favoured.

I do, Mr. Editor, really think that those who profess to enlighten the public mind upon any given subject should themselves be masters of the principles of the subject upon which they treat.

ALFRED LASS.

30, *Gracechurch Street, E.C., Oct.* 28, 1878.

THE VALUE OF RESIDUALS FROM COLONIAL GAS-WORKS.

SIR,—The consumption of gas in colonial towns increases very rapidly, and, with the increase, the difficulty of disposing of all the products, except coke, for which a sale can always be found at some price.

Will your readers kindly give some information as to what prospect there would be of effecting a sale of the tar and ammonia products, if shipped to England, stating the best mode of package, and the probable price that could be obtained, delivered in the docks in London?

Information such as the above would be invaluable to managers of gas-works at the Antipodes.

J. R. G.

THE AITKEN AND YOUNG PROCESS OF GAS-MAKING.

SIR,—All the results published by you as to the above have been those obtained while using cannel coal or shale. It may interest your readers to know that we lately tested some common (gas) coal, West Leverson, sent me by a London engineer, with the following results:—viz., 10,640 cubic feet of 19·09 candle gas (corrected).

I am informed by the London engineer who sent me this coal that he gets from 10,000 to 10,500 feet of 16-candle gas in the ordinary way of working. I think you will admit that this increase of over three candles from the same coal is most satisfactory. I may mention that in working common Scotch splint coals with the patent process we obtained even better results than the above.

I am of opinion that had we taken only 10,000 in place of 10,640 feet, we should have had the illuminating power above 20 candles.

HENRY AITKEN.

Darroch, near Falkirk, Oct. 28, 1878.

WHAT IS THE BEST THING TO DO?

SIR,—At the risk of being accused of "talking shop," or, what is much the same thing, of writing it, I would like to be permitted to state, in answer to the inquiry of your leader of last week—viz., "What is the best thing for gas companies to do in the present position of affairs?"—that the very best thing to do is to keep quite cool, and, above all things, not to attempt to "swop horses in crossing a stream." If one talks individually to gas managers, the public scare is not reflected in the demeanour of those officials at all; nor is it reflected either in the transfer books of their several companies. This is what I learn from London, and it is what I know personally to be the fact here. In Lancashire the people cannot conceive of gas lighting being kicked all of a sudden out of house and home. Its companionship is far too intimate, all through the body politic, for it to be cut at once, and sent to Siberia as if it were a Nihilist. We cannot, it is true, bank out the calm still stream of science, even if we wished; but it is never the property of science to swamp antecedent arrangements all at once. If a man were to telegraph to us from the United States that he had invented a process by which—a spring being touched—our hands and faces could be washed as if by magic, there would be a momentary consternation in the soap and towel trade; but our dressing-rooms would continue quietly to display these old friends all the same. Similarly, our old friends, the meters, although their character for truthfulness is not supreme, are not yet becoming extinct volcanoes.

Your lesson to us from this visitation of the West is, as I understand it, that we must have cheaper gas; you do not lay so much stress upon

the illuminating power—*i.e.*, you are apparently contented with the 16-candle gas as the nominal standard for London. It is a delicate thing to quote any other community against London, because the best of everything is supposed to go there; nor, in quoting this city, for instance, against the Metropolis, as respects gas, do I desire the comparison to be invidious. The fact that London is satisfied with 16-candle gas ought to set the fashion for civilization at large—only it does not; and the explanation may be in the fact that certain communities in the North get one-fourth more lighting power at very much lower cost.

For instance, the city of Manchester gives its customers gas of an illuminating power of over 20 candles, at 3s. per 1000 cubic feet, and hands over every year a very handsome surplus to the ratepayers, in the shape of a contribution to the Improvement Committee of the Corporation. To obtain these results, the Gas Committee use a large proportion of cannel. I have the best means of knowing this, inasmuch as during the last twelve months my firm have sold to the Committee some 500,000 tons of cannels of good illuminating power and large yield, the average price of which will be about 14s. per ton delivered at the works—a price, no doubt, under that at which similar cannels could be delivered in London; but still, the difference of carriage against London would not be important.

I suppose I shall be open to the criticism of pushing my own wares; but I am simply stating facts which I know, and testifying to those I have seen. It is for London generally to lead, and not to follow. Whether the Edison invention will change this policy, it is too early yet even to predict. Gas managers, who themselves are mostly men of science, will not belie their profession by slighting the new agent; they would not do so, even if they could afford. Their occupation is not gone, nor will it go yet awhile; they must stand before a crowded audience amongst whom a cry of fire has been raised, and tell the people to keep their seats, and that a general Inferno has not by any means been yet inaugurated.

ELLIS LEVER.

6, *Piccadilly, Manchester, Oct.* 31, 1878.

THE COST OF COAL AND THE PRICE OF GAS.

SIR,—Allow me to express, through your columns, how deeply I feel Mr. H. Woodall's condescension in taking any notice of my remarks upon the subject of "The Cost of Coal and the Price of Gas;" but, as an excuse for my presumption in touching upon the leakage question at Leeds, I trust I may be permitted to state that at one time I was by far the largest shareholder in a gas company, who had periodically to enter into arduous contentions with the Corporation of the town about the price to be charged for gas during the coal famine, and subsequently I have a vivid recollection that the price necessary to be charged to earn 5 per cent. dividend was mainly dependent on the price paid for coal, whilst the enhanced value of residuals did not compensate for its increased cost.

I see plainly I have touched upon Mr. Woodall's sore spot in mentioning the leakage that he says takes place at Leeds. In my humble opinion, it is not a matter so foreign to the discussion in question as those statements of his, which virtually charge English gas engineers with being either knaves or fools.

No doubt Bingley is a very small place (it cannot help that); nevertheless the Bingley Gas Engineer will presume to remind Mr. Woodall that engineers of no mean experience hold the opinion that a town like Leeds, with its great consumption per mile of mains, can, or ought to, distribute its gas more economically than small ones like Bingley, which has a sparse consumption of gas per mile of its mains, carried through green fields, over hill and dale, to petty hamlets.

But, Sir, whilst complaining of my attempt to compare small things with great, Mr. Woodall says that he has actually gone to a comparatively small town like Halifax—with its sale of 236 millions per annum, and a place, too, so remarkable for its abrupt and precipitous contours, which render it one of the most difficult towns, probably, in England for the economical distribution of its gas—to compare its leakage with that of Leeds.

Why did he not apply to the Engineers of the largest works in England, some of whom would have been courteous enough to tell him how much they have reduced their leakage, and to how low a figure?

In conclusion, I present to Mr. Woodall the following Halifax statistics, which, perhaps, will be of some interest to him:—

Leakage of gas during the following named years:—1861, 13·61; 1862, 12·85; 1863, 13·48; 1864, 17·92; 1865, 14·49; 1866, 7·34; 1867, 10·67; 1868, 8·44; 1869, 13·57; 1870, 10·85; 1871, 11·92; 1872, 10·00; 1873, 9·74; 1874, 11·32; 1875, 11·05; 1876, 12·27; 1877, 10·52.

Now, Sir, when I was appointed to the charge of the Halifax Gas-Works, in August, 1864, the leakage returned to me by the Borough Accountant for the year ending June, 1864, was, as above stated, 17·92 per cent.; but each successive year the leakage decreased, till, in 1866, it ran as low as 7·34 per cent. Three gasholders, however, each subsequent year showed increasing signs of rapid wearing out, and, in consequence, the leakage got gradually up to 11·32 per cent., at which figure I left it in December, 1874. One old gasholder has been completely abolished, and the other two were repaired in 1874 and 1875, but the repairs have not diminished the leakage on the average. For that there may be a cause, which the present Manager, I trust, will tell Mr. Woodall, for our mutual instruction. My own opinion, however, still is, that if the Halifax Corporation paid a salary sufficient to induce any competent man to put himself to *extra* labour, then the leakage might be reduced again to 7 or 7½ per cent., as I got it to in 1866.

GEORGE DUNBAR MALAM.

Bingley, Nov. 1, 1878.

THE GAS SUPPLY OF GOOLE.—It is announced that the works of the Old Goole Gas Company have been purchased by the Aire and Calder Navigation, who now possess the privilege of supplying gas to the whole town of Goole, and it is understood that they intend to connect the mains and works in Old Goole with their other plant, by means of pipes underneath the Dutch River. Hitherto the price of gas in Old Goole has been 8s. 6d. per 1000 cubic feet, and the result of the alteration will be a great reduction, the price in other parts of the town being 4s. 6d. per 1000 feet, with discounts.

Miscellaneous News.

METROPOLIS WATER SUPPLY.

The following are the returns of the Society of Medical Officers of Health on the Composition and Quality of the Metropolitan Waters in October:—

Names of Water Companies.	Total Solid Matter per Gallon.	Oxygen required by Organic Matter, &c.	Nitrogen.—As Nitrates, &c.	Ammonia.		Hardness (Clark's Scale).	
				Saline.	Organic.	Before Boiling.	After Boiling.
Thames Water Companies.	Grs.	Grs.	Grs.	Grs.	Grs.	Degs.	Degs.
Grand Junction	19·00	0·042	0·165	0·000	0·015	13·2	2·4
West Middlesex	18·70	0·055	0·075	0·000	0·012	13·2	3·3
Southwark and Vauxhall	20·00	0·037	0·144	0·000	0·015	14·8	4·6
Chelsea	18·50	0·052	0·155	0·000	0·008	14·3	3·3
Lambeth	20·30	0·023	0·126	0·000	0·020	13·2	3·7
Other Companies.							
Kent	25·40	0·003	0·600	0·000	0·003	18·5	5·5
New River	19·30	0·017	6·135	0·000	0·007	12·6	2·8
East London	19·70	0·038	0·150	0·000	0·005	13·2	3·7

Note.—The amount of oxygen required to oxidize the organic matter, nitrites, &c., is determined by a standard solution of permanganate of potash acting for three hours; and in the case of the metropolitan waters the quantity of organic matter is about eight times the amount of oxygen required by it.

The water was found to be clear and nearly colourless in all cases.

C. MEYMOTT TIDY, M.B., &c.

THE ELECTRIC LIGHT.

The *American Gaslight Journal* for the 16th ult., just arrived, contains a very interesting "Report of Investigations upon the Electric Light as used in Paris," by the Editor, Major G. Warren Dresser, C.E., who, earlier in this year, visited this country and France, and thus narrates his experience on the subject:—

In submitting the following results of investigations, in Paris during the past summer, into the practical workings of the electric light, it is with great satisfaction I am able to say that, so far as the matter is as yet developed, there is nothing which should have a tendency to interfere in any way with the continued use of gas for all general purposes, public and private, as a means of furnishing the best, most satisfactory, and, probably, on any moderately large scale, the cheapest means of illumination. The electric light is thus far either a scientific light, or a light of luxury. It has its special uses, for which it may be well adapted; but gas is still the light for the million.

I found in use, in various places in Paris and elsewhere, practically, two systems—viz., the Jablochkoff, which requires no regulator; and another system in which a regulator is used to keep the carbon points at the proper distance apart, in order to have the voltaic arc formed between them. Of the latter there are several kinds, as made by different patentees.

It is principally in the arrangement of these regulators, and in the manufacture of the carbon points, that progress has been made; but there are none of them, nor any combination of any of them, that give a perfectly steady, uniform light. And I was informed by the officials in charge of the lighthouses at the South Foreland, near Dover, where the electric light has been in use for seven years, that, so far as the carbon points were concerned, none gave such satisfactory results, after very many tests, as the plain sticks of carbon obtained by sawing them out from the cakes of carbon formed in gas-retorts.

In both systems the electricity is derived from some form of magneto-electric machines, which are driven by power at a very high rate of speed.

The power used in Paris is principally steam, and the amount required is estimated by different electricians to be from 1 to 5 or 6 horse power per lamp; but I do not think that an average of 2 and 1½ to 3 horse power per lamp would be far from the fact.

In some instances gas-engines are used, and it was stated that a much more uniform speed was obtained from this motor than from any other. The Otto silent gas-motor, which is now made to give 8-horse power, works most satisfactorily, and is used with a consumption of gas not exceeding 35 cubic feet of gas per horse power per hour.

Unquestionably, the Jablochkoff system has attracted more attention than any other, and it gives me great pleasure to state that M. Jablochkoff himself, and his assistants, showed us every attention, and extended, in the most courteous and friendly manner, every facility and explanation in their power to enable us to judge of the matter.

There were present in Paris, at the time of my visit, in the latter part of June last, something over one hundred gas engineers, Members of the British Association of Gas Managers, as well as about one hundred Members of the French Association, the Société Technique de l'Industrie du Gaz en France, all of whom were interested in the subject.

The conclusions arrived at are the results, not only of what I saw myself, but also of repeated consultations and conversations with many of these gentlemen.

I was also fortunate in meeting there, at the same time, two gas engineers from the United States, whose reputation at home is too well established to require comment from me. They were Mr. Theobald Forstall, of New Orleans, and Mr. Malcolm S. Greenough, of Boston; and, in many ways, I am indebted to them also for valuable aid in getting information.

The Jablochkoff candle, so called, consists of two rods or needles of carbon placed side by side, and kept asunder, or insulated from each other by a layer of plaster of Paris, or a mixture of plaster and kaolin. The carbons are made from retort carbon ground fine, and then pressed together, some cementing material having been added. They are each about ⅛ inch in diameter, and 10 inches long, and are firmly fixed into metal sockets, to which the wires are led, and the connection with the machine is made. When new, the tops of the two sticks only are joined by a small bit of carbon.

One of these will ordinarily burn from 1½ to 1¾ hours. The proportions adopted are those which experience has shown to be the best. Four of these are usually fixed on a stand, and placed within a large opal glass globe, about 18 or 20 inches in diameter, on the top of a lamp-post, which is considerably higher than those commonly used here. As one of these candles burns down, the current is shifted to the next, and so on until the four are consumed. So that, at the outside, the street-lamps would continue burning six hours, when the set of four candles has to be replaced by others.

As a matter of fact, the various street lights of this system were lighted about seven or half past, and were all extinguished by twelve at night, when the gaslights were lighted, and continued to burn till morning. Three steam-engines and one gas-engine furnish the power for the lights in the Avenue de l'Opéra; and at the Orangerie, two 35-horse power engines are running six electric machines for the light there. It can be seen from this that quite a large item of expense would arise from the

attendance required—first, to daily put the candles in place; and, secondly, to shift the currents from one to another candle as it burned down.

The price of each candle was stated to be 60 centimes, or 12 cents. If each one of these averaged to burn for 1¼ hours, the cost per hour of the candle alone, without charge for interest on machinery, &c., or cost of the necessary attendance, would be 9½ cents. each. In the Avenue de l'Opéra, the electric lights, when burning, take the place of about ten gas-lamps, and these gas-lamps are much nearer together than in New York city.

At the present time the street-lamps in New York, below Thirty-Fourth Street, are lighted for 12 dols. per annum, including all charges for cleaning, painting, &c., or at the rate of about 1 dol. per 1000 cubic feet of gas furnished. The lamps are to burn 3 feet per hour; ten of them would consume 30 feet per hour, and the cost for the gas, care, &c., of the ten lamps would be 3 cents. per hour, or about one-third of the price of the Jablochkoff candle alone, as used in the Avenue de l'Opéra in Paris.

What the other charges would amount to it is extremely difficult to determine, as we found the greatest dearth of actual data on this point.

I was informed that the estimated cost per hour of running four lights, carbons included, was 3 francs and 54 centimes, which would be 88½ centimes per hour per light, which would be equal to about 18 cents. currency.

It is argued that while it costs more, there is much more light furnished; but this gives rise to the very important question as to how much of this additional light is useful light, leaving out of the account the character of it. And at this point I would most decidedly take issue with most of the estimates that the promoters of the electric light give of its value in standard candles. It is called a light of 1000, 1200, 1500, even 2000 candles.

I am willing to admit that, when an attempt is made to patch up an ordinary photometer, and try to compare this intensely illuminated point with the light of ordinary candles, or even with the Carcel lamp, which is about 10 candles, the results indicate fabulous figures; and well they might, for a variation of 100 or 200 candles would thus be hardly perceptible. But what I mean to assert is this, that, taking four of Mr. Sugg's triple-ring Argands, which give a light of 250 candles each, and light them in any proper place, they would give much more light than the 1000-candle power electric light.

The intensity of the electric light may show, on the small shaded disc of the photometer, a very high illuminating power. But the volume is lacking. It has not diffusive power. This results from surface of light, or the number of luminous points that throw off the light.

At the recent meeting of the British Association, in Dublin, Mr. J. R. Wigham explained the construction of the largest gas-burner lights, as adopted by the Irish Lighthouse Board, by which he obtains a column of light 13 feet high by 3 feet wide, and, in connection therewith, refers to this very point of intensity and volume in most apt language,* and actually suggests the idea of bringing into this column of light, as an auxiliary for intensity in extremely foggy weather, the electric light.

This is as it should be. The two lights may assist each other; and, doubtless, one result of the experiments in electric lighting, in streets and public squares, may be to cause the people to demand more light and better, and that can most easily and cheaply be obtained by increasing the size of the burners, improving the character of them, and increasing the number of the lamp-posts. A perfectly reliable, well-diffused light is the best police that any city can have. The electric light, as used in the streets of Paris, is not such a light.

Of the system of electric lighting where regulators are used we saw a number of specimens. The Serrin regulator was the first, I think, and has been in satisfactory use for years. But recently there has been much money, time, and talent devoted to the study of electric science, with a view of developing this light, and there have been many regulators presented for public approval. The most prominent are those of Messrs. Carré, Jasper, Halte, and Lontin.

The object of the regulator is to preserve the relative positions of the carbon points as they are being consumed. The light is formed as the current passes from one point to the other.

In order to start the light the points are in contact, so as to establish the circuit through them; then they are drawn slightly apart, say, a distance of ⅛ inch, and the voltaic arc is formed between the two ends. The object of the regulator is to hold the carbons in position, to maintain this short distance between the points, and to keep the carbon points moving towards each other as they burn away. It will be seen that such an instrument must be somewhat complicated and expensive; but yet there are several that appear to function almost perfectly when the carbons burn uniformly.

The lights from these lamps are not different in character from the other system. It is usually this kind of apparatus that has been applied in military and engineering works, to the lighting of foundries, railroad stations, and other large areas. The testimony that we were able to obtain, as to the working expense, as well as the satisfactoriness of the light given, was amusingly indefinite and contradictory.

At the station of the Lyons Railroad it had been in use for some time, and discontinued. While one official told us that the light was unsatisfactory and expensive, and that that was the probable cause of returning to the use of gas light; another, claiming to know much of "the bottom facts" in the case, assured us that the cost was a mere trifle, and that the light was far superior to gas light.

The conclusion arrived at, on our part, was that the light had been replaced by gas for some reason, and that the gentlemen having the full account of the cost was not to be found.

At the St. Lazare station the electric light was in use in portions of the yard, and in freight houses, and preparations were being made to introduce it into the passenger station; but I understood that this was being done at the expense of the manufacturers of the apparatus for the purpose of trial.

It was claimed, by the promoters of the various systems, that there were as many as 1000 applications of the electric light in France. It was at a season of the year when no artificial light was required in the various mills and other places where it had been introduced, and, consequently, no opportunity was afforded of seeing the practical working of the light in such places; but a correspondence with some of the parties who had tried it, resulted in about the same contradictory replies as in other places. One gentleman who was employing a large number of men, in the manufacture of articles requiring great accuracy of workmanship, claimed it to be superior in all respects to any other light; while others, who had tried it in mills, where weaving and spinning were done, pronounced most decidedly against it, and in some cases had discontinued its use.

The most perfect exhibition of the light that I saw was at the establishment of Messrs. Sautier and Lemonnier. This firm have been engaged for some time in making, among other mechanical work, lighthouse apparatus, and they are the makers of electric light apparatus for military and engineering purposes. They placed the regulator in a vessel which entirely concealed the direct light from view. This was suspended near the ceiling of a room about 30 feet by 60 feet, well whitewashed on all sides and at the top. All the light coming as a reflected light from the ceiling, and the piercing brilliancy of the lamp being cut off from view, the result was a very strong, well-diffused light, with but little shadow, but, nevertheless, very trying to the eyes when used for a short time.

M. Lemonnier also showed the use of the light in front of a reflector, fixed on a stand, with universal joint, so that it could be turned in any direction. These were on the balcony of a high tower; and I believe I am not exaggerating in the least when I state that a man could be clearly distinguished, at night, at a distance of three or four miles, when within the rays of light.

The colour of different houses, three miles away, could be as easily distinguished as by daylight. And it is here, in special uses, that the electric light is of great value. I look upon its introduction as that of a co-ordinate branch of illumination, in the same way as the calcium light is; but I cannot see where any hostility or competition can arise between it and gas lighting.

As to the different machines used for generating the electricity, there are the usual number of competitors. The more prominent is the one known as the "Alliance," perfected by Messrs. Nollet and Van Malderen; the Gramme, the Siemens, the Lontin machines, in France; and the Holmes and the Siemens in England; while we have in our country several that are probably equal to any of them.

Then behind all these—viz., the carbons and the regulator, the cables connecting these with the machines, and the machines themselves—comes the motive power—steam-boilers, furnaces, coal, stokers, &c., &c.; so that it will be seen that it is not so simple a thing after all. And, what is more, supposing the character and cost and quality of the light to be what is wanted exactly, it is not a reliable light, so simple are the causes that may extinguish it. In fact, there is no certainty that it may not go out at any moment.

Another point, which is a commercial one. How is the electric light to be measured and sold? When gas is bought, the amount of light that may be derived from it is known. The quantity is accurately measured, and the quality is officially determined.

From all this statement you will see, I am sure, that, as gas-makers, the electric light may be welcomed by us as an ally and coadjutor, and not as an enemy.

Too much credit cannot be given to the zeal and energy with which the electricians of the present day have given themselves to this subject; and I cannot close this report without acknowledging the kindness and courtesy with which I was received and assisted by all of those directly interested in the electric light in Paris, to whom I applied for information and explanation.

To M. Jablochkoff and his assistants; to M. Lemonnier; to M. Arson, Chief Engineer of the Paris Gas Company; to M. Servier, President of the Société Technique de l'Industrie du Gaz en France, and his associates; and to M. Fischer, of the Jury having charge of lighting and heating apparatus at the Exposition, I am under special obligations, and desire to return especial thanks for their aid, &c.

New York, Oct. 1, 1878.

* See JOURNAL for Sept. 17, p. 420.

The following article, from the pen of an able Professor at one of the Metropolitan Hospitals, appeared in the *Lancet* of the 26th ult.:—

The world is waiting, with very natural impatience, for Mr. Edison's invention, which we are assured is to revolutionize lighting, warming, and cooking at a touch. The form in which his preliminary notice has been presented—the somewhat theatrical *avant-coureur* which he has despatched—is not calculated to inspire blind confidence; but, on the other hand, his brilliant successes in acoustics, and his known skill and energy, forbid total unbelief, and compel us for the present to suspend our judgment.

The problem to be solved may be simply stated as follows:—It is admitted that the light of the electric arc is whiter than any other; that it avoids pernicious products of combustion; and that, light for light, it is cheaper than coal gas. Every property of solar is possessed by electric light, and the latter may even be made to compete in intensity with the former. Its power of penetration is enormous, and for certain purposes, such as the illumination of lighthouses, men-of-war, and public places and buildings, its suitability is denied by none. But, on the other hand, the disadvantages of the light, as now applied, are equally evident. It is at once dazzling and unsteady; it blinds one moment, and is gone the next. It requires a complex and expensive machine at every light—a machine liable to derangement, and useless if deranged; and, if the lights are arranged in a circuit, the interruption of one involves the interruption of all.

These defects are due, firstly, to the fact that the light is only obtained in full brilliancy between carbon points, which must be kept at a fixed distance apart, although the points themselves are constantly varying in length; and, secondly, to the difficulty—or rather, at present, the impossibility—of obtaining diffused light from so small and so intensely brilliant a centre. Various contrivances have been adopted to overcome the first of these objections, but none hitherto have been perfect, because it is only when the current begins to slacken, and the light thereby to fall off, that the compensating machinery can act. For a similar reason, all attempts to subdivide the light, so that a single current should yield light, as gas does, at many distant points, have hitherto met with very imperfect success. It is hard enough to keep the light constant at one point, but to keep it constant simultaneously at many points, when a failure at one would induce total darkness at all, is at present impossible. When it is added that the electrical resistance at every light is very great, and that the "lighting of the gas" in any one house would suddenly introduce a great additional resistance into the circuit, the difficulties of the problem will be appreciated.

These, then, are some of the difficulties which Mr. Edison professes to have overcome. It is useless to speculate when the facts will so soon be revealed. It is, of course, possible that the ingenious American may, to use the words of a scientific contemporary, have "turned the flank of the difficulty," by avoiding the use of carbon altogether, although, even then, it is hard to understand how uniform light, at a constantly varying number of centres, can be obtained. We by no means deny the possibility, but simply leave it to time and Mr. Edison to prove it.

One consideration of especial interest for our readers remains—namely, the effect, good or evil, of intense light on the organs of vision. A very interesting discussion of this question will be found in M. Proust's "Traité d'Hygiène Publique et Privée," recently reviewed in these columns. Without endorsing all the author's views, we find in many of his arguments serious matter for thought, and even fear that the future may confirm, in regard to its effects on eyesight, his condemnation of "*cet éclairage profondément dangereux.*"

The following appeared in *The Times* of Saturday last:—

To the Editor of "The Times."

Sir,—"Gas *v.* Electric Light" is a cause just now being tried before a public tribunal.

The questions of vested interests, value of gas shares, and the like,

unfortunately, do not concern me. Allow me, therefore, as an independent witness, to say a few words in the cause under discussion.

One advantage of a gas flame is that it can be easily regulated—in other words, turned up or down as required. The electric light, on the contrary, cannot be turned down; for, reduce it to its *minimum*, you still have a light of 370 candles, to quote a very low estimate, and one that my own experiments would not justify me in adopting.

Nature has ordered that darkness and light should alternate. We may some day have to revise the authorized version—"The sun knoweth not his going down, nor the moon her rising."

Again, the electric light practically issues from a point, the gas flame from a surface of sensible magnitude. Hence, in the former case, the intensity of the shadows. Surely this alone unfits it for use as a room illuminant. There is a remedy, I admit. That is, you may have two electric lights. But this means twice 370 candles. And if one electric light be too much, *à fortiori* two are.

The electric light is peculiar in its composition. It contains an enormous quantity of the blue and violet rays of the spectrum, and of rays beyond the violet. These rays are the chemical rays—that is to say, they are the rays endowed with intense chemical activity. The gas flame is very wanting in these rays. Photographers know that a small gas flame in their dark room is practically inert on their sensitized plates; while, if but a single ray of the electric light were admitted, all their work would be destroyed. To use a scientific phrase, the electric light is remarkable on account of its "actinism."

These facts have a practical bearing. I have made a point of remaining in the neighbourhood of the electric light for at least three hours, in order to observe its effects upon me after being exposed to its action for some time. For a time nothing struck me except the intensity of the illumination and the darkness beyond. But, before long, my eyes became entirely blinded to all rays except the blue; and, as a result, everybody and everything appeared of a ghastly blue tint. For hours after I returned home the blue rays haunted me; but, what was still worse, I suffered from what I am rarely a sufferer from—an intense headache, especially seated about the region of the eyes.

As a medical man, I am convinced that whatever may be the advantage of the electric light as an illuminant for large outdoor spaces, it can never be used as a room illuminant, or even as a general street illuminant, with advantage, save to the medical profession generally and to ophthalmic surgeons in particular.

Your obedient servant,

C. Meymott Tidy, M.B., Professor of Chemical and Forensic Medicine at the London Hospital, Medical Officer of Health for Islington, and late Deputy Medical Officer of Health for the City of London, &c.

48, *Queen Anne Street, W., Oct.* 30.

SOCIAL SCIENCE CONGRESS.

Address of Mr. W. H. Michael, Q.C., in Opening the Proceedings of the Health Section.

(*Continued from p.* 642.)

It is one of our happy beliefs, that all who have to obey the law are cognizant of its provisions, of what it enjoins, and of what it prohibits, and it is no excuse for disobedience that the wrongdoer is ignorant and unconscious of offence. This is wise, and it would be impossible, without such an assumption, to secure any protection to life or property; but it surely behoves those upon whom the responsibility rests of legislating for our governance, to take care that the law upon any given subject should be capable of being clearly understood and easily acted upon.

It is to the credit of this Association that mainly through its exertions the confused and unshapely heap of what was called sanitary law has been reduced into due proportions and moderate compass. Most persistently did this Association represent to successive Governments the anomaly and disgrace of retaining in the Statute Book conflicting enactments, which defied the acumen of the Bench to reconcile or construe.

Beginning with the Towns Improvement, and Towns Police Clauses Acts, and followed by the Public Health Act of 1848, Nuisances Removal and Diseases Prevention Acts were successively passed. Then came the Local Government Act of 1858, Sewage Utilization and Sanitary Acts, of which one was usually added every session to the already unwieldy mass of legislation. Is it any wonder that Sanitary Authorities were often in the wrong in attempting to do that which the most learned lawyers failed to accomplish, or that such a state of doubt and uncertainty with respect to the law should have seriously impaired the progress of sanitary reform, to which, more than at any previous time, public attention was anxiously directed? This Association succeeded in inducing the Government of the day to appoint the Royal Sanitary Commission of 1869, and, as a first requisite, urged a consolidation of the Public Health Statutes. This was accomplished by the Public Health Act of 1872, and more perfectly by the Public Health Act of 1875—a statute which, whatever may be its defects, is clearly drawn, and embodies in itself the law on sanitary matters governing all the country, with the exceptions which will be presently noted.

It is to be regretted that this Act has been amended by the Public Health Act of 1878; not that the amendment may not be in itself good and called for; but I very strongly hold to the opinion which I have before frequently expressed, that where a general Act is altered or amended, the statute so amended should be repealed, and the amendments incorporated into a new general Act, so that there should always be but one Public Health Act; and those to whom is entrusted the difficult duty of enforcing the law and carrying out its provisions should always, in one statute, have before them a clear guide in the discharge of their duty. It is owing to neglect in the mode of amending statutes, by constantly adding new laws, leaving the old in force, that there grows up an incongruous aggregate of statute law, the various parts of which it becomes difficult, if not impossible, to reconcile.

I hold that there should be attached to Parliament an official draftsman, whose duty it should be, when the principle of any amendments and clauses embodying the same had been carried, to strike out of the Act to be amended any conflicting matter, and to embody the new provisions in the original Act, and that the Act thus amended should, so far as these alterations and amendments were concerned, be brought before the House for final approval. Experience is continually disclosing to us failures or omissions in our enactments, and if, to amend these, we are to have year by year a new statute, we shall soon arrive at the same state of confusion and discredit, from which, at least for the present, we are happily free.

We may hope, too, for our Metropolis—so huge and so constantly augmenting—that at an early period there may be devised an amended and consolidated code; for, besides the law of Metropolitan management being spread over many statutes, there are matters of serious import, as affecting the public health, calling for alteration and attention.

Mainly through the state of the law which has been described, another difficulty has arisen, which is much to be regretted, and which will largely interfere, in the future, with a national system of health-protection. I allude to the great number of private Improvement Acts under which local government is administered in our cities and towns, so that in no two great centres of population in our country can it be said that the law is exactly like; and a householder removing from one district to another may find himself liable to legal proceedings for acts which in his last domicile were beyond the cognizance of the law.

I shall have to point out how, in another way, these private Acts prejudicially affect general interests. Suffice it at present to say that general uniformity of the law is much to be desired. Bye-laws on important matters—such as the building, drainage, and ventilation of houses, and the formation of streets—are to be deprecated, and the provisions usually inserted in bye-laws should form part of any general statute, and should only be special in those matters which local peculiarities rendered essential. Were this to be accomplished, there are but few alterations in the law which experience has shown to be desirable; and with the modifications in administration to be hereafter noticed, there is ample power lodged in Sanitary Authorities, except in a few minor matters, efficiently to conserve the interests of the various districts entrusted to their care. These districts comprise the whole of England, and happily, now, no place is left without sanitary guidance and control. But the distinction made between rural and urban districts cannot be said to work well for the public interest. Neither has any reason ever been adduced for any difference in the law which is to affect town and country. Disguise it as we may, the one consideration to which all matters affecting local government are to be brought is a money one; and the incidence and amount of taxation must, for at least some time to come, be a prime factor in our calculation. Houses in the country ought to be no more independent of sanitary considerations than houses in towns. Neglect and ignorance will lead to the same fatal issues in the one as in the other, and in both there is the same tendency in owners and builders to avoid pecuniary obligations, and to escape supervision and control.

The consequences of the present state of the law are to be seen in most of our great towns. Urban Sanitary Authorities have power to prescribe the width, direction, gradients, sewerage, lighting, and materials of new streets. They control the height, position, ventilation, and drainage of new buildings, and act as surveyors of highways. These powers are denied to Rural Sanitary Authorities. Hence, immediately adjoining the boundaries of towns—not separate from them, but often on the other sides of streets which form their boundaries—there have been, and are daily, springing up, new towns, built without method, and irrespective of anything but the fancies of their projectors and their desire to avoid expense, giving and to give the present and the next generation exactly the same amount of trouble which we now have with the streets and houses of past time.

The genius of one of our members, a Past-President of the Section of Health, has painted for us in glowing, almost in fairy, colours, the creation of a City of Health, as "a thing of beauty and a joy for ever." If his imagination, so skilfully transmitted to paper, could but be actually transferred to the solid earth, our bodily ills would be almost forgotten, and prolonged lives would almost attest the truth of the philosophers famous *aurum potabile*. But we have to do with sterner matters. We cannot destroy to recreate. We have to deal with past neglect, past selfishness, and present misery, disease, and death. How difficult this is, no one can know but those whose duty it is to deal with the sufferings of humanity as they show themselves in the alleys, courts, and slums of densely-peopled districts. Daily we deplore our comparative helplessness to deal with these legacies of degradation; but, at least, we can prevent their increase. To do this, all distinction between town and country must be swept away. The absurd boundaries of districts, of towns, and even of counties, must be remodelled, not to suit antiquated ideas or sentimental distinctions, but to allow our increased knowledge of the value of human life, and of the means to be taken to protect it, to be fully and fairly exercised. Communities feel deeply, and strive to avoid the growing up of new, neglected suburbs to their towns, where sanitary regulations are entirely set at nought; where Towers of Babel are erected, and offensive trades are established and carried on with impunity; where streams which form boundaries are used as common sewers, and where, owing to different jurisdictions, it is often found practically impossible to apply a remedy; where platforms of railway stations are half in one district and half in another, and it becomes a work of skill to settle upon the proper mode and proper person to arrest a pickpocket.*

There is no session of Parliament in which Bills are not introduced and promoted by public bodies, to alter the boundaries of boroughs, in order to avoid this state of things—a direct outcome of the existing public health statutes. Every one acquainted with Private Bill legislation will know how extremely difficult it is to carry such measures. The opposition of persons interested in property, who would, by what is proposed to be done, be subjected to heavier burdens in the shape of local taxation, proves powerful enough, in almost every case, to defeat proposed extensions, by which these portions of rural districts are sought to be brought under urban regulations. A reconstitution of the boundaries of districts within which Sanitary Authorities exercise control is the first requisite to ensure a thorough amendment of the public health.

What is most urgently wanted is the appointment of a small Commission to inquire into, and report to the Government upon, the boundaries and conditions of the various districts in England and Wales, and to recommend such readjustment as would allow the whole country, when subdivided according to local exigencies and position, to be governed by uniform sanitary laws. This would entail a further change of equal

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* "Distinctions as to Powers between Urban and Rural Sanitary Authorities under the Public Health Act, 1875." Urban Authorities, by the following sections, can exercise the accompanying powers, which are not conferred upon Rural Authorities:—10. Artizans and Labourers Dwellings Act. Labouring Classes Lodging-Houses Act. Baths and Washhouses Acts.—20. May make a map of sewers in the district.—25. May inflict penalty for building house without drains.—26. May inflict penalty for building over sewers. May inflict penalty for building or constructing vault or cellar under carriage way.—39. May provide public urinals, &c.—44. May make bye-laws for prevention of nuisances arising from snow, filth, &c. For prevention of the keeping of animals so as to be injurious to health.—45. May provide receptacles for deposit of rubbish.—47. May inflict penalty for keeping swine or a pigstye in a dwelling-house, so as to be injurious to health. May inflict penalty for keeping stagnant water in dwelling-house. May inflict penalty for allowing contents of water-closet, &c., to overflow. Power to abate these nuisances and recover expenses in a summary manner.—49. May prohibit accumulation of manure, filth, &c.—50. May direct periodical removal of manure, &c., and recover penalties in default.—66. May provide fire-plugs for assistance in case of fire.—112. May prohibit establishment of offensive trades.—113. May make bye-laws as to offensive trades.—114 and 115. Have control over candle-houses, &c., within or without their district.—144. Made surveyors of highways.—146. May agree as to making of new public roads.—147. May construct or adopt public bridges.—148. May enter into agreement with Turnpike Trustees for repairing of roads.—149. All streets being highways vested in.—154. May purchase premises for improving streets.—157. May make bye-laws regulating all matters connected with new streets. May make bye-laws regulating all matters connected with new buildings. May make bye-laws regulating all matters connected with ventilation of buildings. May make bye-laws regulating all matters connected with drainage of buildings.—161. May contract for lighting district with gas. May supply gas.—162. May purchase gas undertakings.—164. May purchase, take, and regulate public pleasure-grounds.—165. May provide public clocks.—166. May provide or purchase public markets.—169. May provide public slaughter-houses.—171. Provisions of Towns Police Clauses Acts incorporated. Provisions of towns as to obstructions and nuisances in streets. Provisions of towns as to fires. Provisions of towns as to places of public resort. Provisions of towns as to hackney carriages. Provisions of towns as to public bathing.—172. May make bye-laws for licensing horses, boats, &c., for hire.

importance, and it is believed of even greater utility—the reconstitution of Local Authorities.

That something is needed in this direction is evidenced by the introduction, by the Government, of the County Administration Bill during the last session of Parliament. To any one who wishes well to his country, it must be a matter of supreme moment to support, with all his power, the efficiency and independency of local government. It should be a part of our earnest work to make every man feel that in this he had his share, and was responsible for its success. Upon its maintenance depends the stability of our institutions and the force of our national character.

Whatever, therefore, tends to its improvement must be of the highest national import. We at the present time fritter away our energies in the subdivision of our local bodies for purposes of local government. We have Town Councils, Local Boards of Health, Improvement, Drainage and other Commissions, Boards of Guardians, Highway Boards, Burial Boards, Vestries, and the like, all discharging functions closely akin to each other, with various staffs of officers, with different officers collecting different rates, and often clashing in the functions discharged and the jurisdictions exercised. To amalgamate these into one body, discharging all the functions of municipal government within the newly-constituted districts before sketched out, would be to constitute a local parliament of the first instance of high importance, which would attach to itself the best ability and highest character of the district, and would, not only by its efficiency, but also by the economy resulting from an amalgamation of duties, officials, and offices, produce an amount of good which, under our present system, or want of system, is quite unattainable. Within the district of the county, in order to secure county administration, to manage county buildings, to execute joint works, to act as a board of control or appeal, or to conduct great enterprises, a representative county board would be required. The chairmen of all the district boards joined to an equal representation of great owners of property within the county, chosen by direct voting of such owners, would secure a county board of the highest order; and while, on the one hand, there would be lodged in them power to prevent hardships to individuals, there should be also power to determine on, and correct neglect of district sanitary authorities in executing, required sanitary works in any district within the limits of their county administration. Even wider powers and a board of larger area of representation would be required in order to secure an object of national importance—the conservation of our rivers.

Here, again, we are met with the consequences of our own neglect. When cesspools for the reception of sewage, close to human habitations, were abolished, to the infinite advantage of the inhabitants, then, with a total disregard of consequences, our rivers and watercourses, through the length and breadth of the land, became converted into open receptacles of fœcal matter, with results which were inevitable from such disastrous misuse. Manufactories built along their course, and using their waters for various purposes, added largely to this impurity, until it became so urgent to take steps, in the public interest, to avert, or at least limit, what was already a calamity, and threatened to provoke a national disaster, that the Rivers Pollution Prevention Act of 1876 was passed, which prohibits the passing of any solid matter or sewage into streams and rivers. It is as yet too soon to predicate the results of this measure, but its remedies require to be applied with a firm, yet gentle hand, for the issues involved, so far as mercantile interests are concerned, are momentous, and peremptorily to deal with, and all at once entirely to prevent what we have long, by sufferance, allowed, would be, in any case, to paralyze industry, and to defeat instead of promoting our objects, by entailing widespread distress and perhaps ruin, with consequent famine and death upon our working populations. But surely in no case should sewage from inhabited dwellings be permitted, unchecked and unpurified, to flow into our watercourses, as though they were the natural outlets and outfalls for systems of sewerage. By chemical deposition, by irrigation and filtration, we have sure means of so depositing and subsequently oxidizing the putrescible matter contained in sewage, that the evil results of its presence may be entirely removed.

It is an outcry which, by overstatement, tends to deceive, and therefore to defeat this object, that any admission of sewage into rivers produces disease. There can be no doubt, in the minds of candid inquirers, that water containing sewage, and mixing with the water used from wells, is productive of disease; but, on the contrary, sewage matter is so easily destroyed and oxidized, that, received into a large volume of running water, it speedily vanishes, and the minutest analysis of the most experienced chemist fails to furnish the smallest trace of its presence. Neither has the microscope, as yet, given any indication by which we can detect it. No observer has yet been enabled to say that when, five miles up a river, a quantity of sewage, equal to one hundredth part of its volume, had been received and mixed with its waters, that at the end of that distance down the stream, science could demonstrate its presence. It is said, by those who hold strong views on this question of previous sewage contamination, that a broad distinction is to be drawn between healthy and unhealthy sewage, and that while water containing the former may be drunk with impunity, there is no river in England long enough to destroy the evil influence of an admixture with its waters of the smallest quantity of the excreta of persons suffering from enteric disease. There is no evidence to support this proposition. The germs of any disease such as typhoid fever and cholera have defied scientific investigation, and have not been demonstrated at any time in any water, whether river water or well water. And, moreover, were any such theory correct, it might fairly have been expected that, during periods of epidemic visitations of cholera, and other diseases of a like type, that the disease would have proceeded down the rivers from their sources to the sea, of which there is not one single authenticated case; but the whole evidence tends to the conclusion that such epidemics have always travelled in exactly the opposite direction—namely, up stream, from the outfall of the river to the source.

But, apart from all disputes of a technical character, it may now be fairly taken for granted that the Legislature will not authorize the employment of river water, receiving sewage above the intake of a water company, as fit to be used for domestic supply. During the past session, the Durham Water Company endeavoured to obtain statutory powers to supply the city of Durham and surrounding district with water taken from the River Wear. This river receives in its course the sewage of many thousands of the population. It was shown that the water had been supplied to the community for 30 years; that there was, during the whole of that period, an immunity from any invasion of epidemic disease within the district supplied by the Company; that the water was colourless, of good taste, and chemically free from any trace of sewage—indeed, in some particulars, according to the adverse witnesses, suspiciously free from nitrates, the usual witnesses for previous sewage contamination. But the Committee of the House of Lords, to whom the Bill had been referred, refused to sanction the use of this water.

The town of Cheltenham in the same way, during the past session, opposed the extension of the use of the River Severn, although the Water Company supplying Cheltenham supplied Tewkesbury with that water, as was shown by evidence, without injury, and to the satisfaction of those using it. The Committee of the House of Commons, who had charge of the Bill, refused their sanction, and the Water Company, under these circumstances, parted with their undertaking to the Corporation, who will now have an opportunity of meeting what is the undoubted wish of the inhabitants of this city—that further supplies of water should be sought in springs or streams far removed from suspicion of contamination.

Rivers must at all times, in their course, receive pollution from manured fields and otherwise; and, in the national interest, and looking at the water supply of the country as a great national question, they should be much more carefully conserved in the future than in the past, although it may be impossible, under the varying circumstances under which water must be supplied, to carry out the idea of a National Water Supply. Yet Conservancy Boards to utilize our water resources, whether as sources of power or as sources of supply, are urgently needed, and are alone competent to deal with the momentous questions which arise between landed proprietors (whose lands must be kept from flooding), navigation, and manufacturing interests, all often in conflict; and, above all, to ensure, in the fullest possible manner, sufficient and pure supplies of water for domestic use.

The further question of the storeage and supply of water to meet the famine too often deplorably present in mining and manufacturing rural districts, urgently requires examination at the hands of the Government, through a Commission whose duty it should be to report what steps should be taken to meet a want which painfully urges itself on the attention of all interested in such localities as are at present left without adequate means at hand for its supply. The future and economical use of upland waters, and future guardianship of watershed areas, where not already appropriated, are matters which Conservancy Boards may well undertake, with more than local advantage to all concerned, while a more complete knowledge of the water-bearing strata of the country is a need which every one who is interested in improving the water supply of the community has long and urgently felt.

No question affecting the administration of public health law is of higher importance than the constitution of any central authority which is to regulate future action. At present the Local Government Board—who, as such, I believe, never meet, consist actually of a President and his Secretary, with a Law Adviser, and a staff of Inspectors; and practically this department of the State has hitherto exercised the government of a Board of Control. The Board have considered it to be their duty to occupy the position of an arbitrator between ratepayers and their authorities, giving or withholding consent to what was wished to be accomplished in the alteration of boundaries, in executing improvements, and in carrying out the various purposes of the Sanitary Acts by the authorities charged with these and like duties. This is surely a very meagre and imperfect view of what a central authority might and ought to accomplish. I have long advocated the establishment of a Ministry of Health and Justice; and although the union of these functions under one minister is by some thinkers held to be fanciful, there are good reasons which may be given for their combination. What is advocated is not the creation of a new and additional ministry, but a reconstitution of the duties of departments already existing. The functions of a central authority—call it by what name you will—are now, in the loosest manner, spread over nearly every one of the Government offices, part fulfilled by the Local Government Board, others by the Board of Trade, the Registrar-General, the Privy Council, and the Home Office. It cannot but lead to efficiency and economy to have all these centred in, and discharged by, one department of the State. In the education of the people it will not be without avail, to show the importance attached to public health by those highest in the State, that a Cabinet Minister should be charged with its oversight.

It is not sufficient that such an authority should content itself by merely pronouncing an authoritative judgment on what is proposed to be done in any locality. It should be the centre of action and of information, the support of every authority throughout the country; not derogating from, or weakening, local government, but assisting and developing it; ready at all times to further good schemes by counsel, and doing, as it would well be able to do, much to remove those difficulties now inevitably arising in every locality which strives to emancipate itself from the consequences of past ignorance and neglect, and of past disregard of health laws. How much is to be done in this direction, what vast assistance might be given by intelligent guidance, counsel, and direction to inexperienced local authorities, only those who have known the struggles of conflicting authorities and jurisdictions, the uncertainties of the law, and the obstacles imposed by the selfish and the interested, in maintaining the existing state of things without change, can accurately gauge.

It is pitiful, and it often verges on the ridiculous, to read of the harassment of authorities in determining what system should be pursued to do what they desire for the public good, and more than painful to witness the greed of individuals to secure their own private interests at any cost to the health or life of others. All this must be known to fully appreciate how a central helping and counselling authority would be welcomed by those who have learned to look on the Board in London as another lion standing in the path and preventing their onward progress.

To further accomplish this progress, a public medical service of officers of health of various grades should be constituted, on a plan similar to that of the Army and Navy medical services. At present there is no registrable qualification for medical officers of health. No special training is required, and any medical man, however unused to the discharge of the duties which should devolve on a practitioner of preventive medicine, is competent, so far as law and custom is concerned, to discharge the duties of medical officer of health. This must be so until there is a recognized standard of qualification; and no great progress can be made until all officers of health are debarred from engaging in private practice. For experience has shown that it is impossible that the full benefit of the services of these, the most important links in the chain of health-service, can be obtained, until the co-operation of the whole medical profession can be secured in aid of the official duties of the medical officers of health. The position of a medical practitioner is so peculiar that it cannot be expected that full information of infectious cases of disease in the earliest stages, and when preventive measures are most urgently called for, can ever be obtained, except where there exist medical officials whose assistance can be sought and obtained with security against rivalry, and without fear of revolting the feelings of the parents and friends of the sick. We may not be able to secure a full registration of sickness, but it is essential to health-progress that there should be the earliest intimation of the occurrence of the first of the class of cases which rapidly spread from house to house, and to which, by the appliances of science, means of prevention can be easily and securely applied; and this can be only obtained by having in each district a highly and specially educated public medical servant, competent to deal with every difficulty, and whose assistance, instead of being feared and avoided as a probable rival, will be largely sought by the private medical practitioner as a counsellor and a friend. Our experience of the past must be much altered throughout the whole of our land, before district authorities will be willing or indeed able to pay for the services of such invaluable protectors of public safety. It is essential that districts shall be of such size as will allow the payment in each zone of action of at least one health officer. And as what is local is often general, and it is impossible to limit the area which is advantaged, the full

benefit of what is here advocated can only be obtained by the payment of a part of the cost of such services out of general taxation levied by Parliament. Indeed, such a class of men as is here indicated could never be contented unless their emoluments were placed above caprice, and unless, in giving up private sources of emolument, their salaries were secured to them, as in the case of members of other branches of the public service.

It is from the services of competent local public medical officers being secured to the State that we may anticipate with confidence, at an early date, the abolition of the cumbrous, antiquated, and inefficient procedure of the coroner's court. In every case of suspicion it would be the duty of the medical officer of health to examine into and report upon the cause of death; and with the creation of public prosecutors—an office we may trust soon to see established—there would be a check upon crime, and a certainty of its discovery and punishment—always its truest preventive—which the present system, or want of system, entirely fails to provide. A highly-trained mind, on the spot, accustomed to such inquiries, with all the materials at hand for investigation and discovery, would accomplish apparent marvels, and, if anything in the way of motive would act as a deterrent from crime, would supply the best in the terror of discovery; for, to the ignorant and uneducated mind, the piecing together of portions of circumstantial evidence, until the whole history of the crime is laid bare, often appears to border on the marvellous.

Our present modes of proceeding furnish, at every turn, loopholes through which crime may pass away undiscovered or unpunished, unless the evidences are unmistakeable, and even then numerous chances are against conviction. We call before the coroner, in some secluded place in the country, to give evidence as to the cause of death, the medical practitioner who has last seen and attended upon the deceased person in life. His evidence is valuable as to facts; but here is a man who, perhaps, for 40 years since he left the medical schools, has had no occasion to study the complex equations of forensic medicine and medical jurisprudence. Can we be right in placing upon one so unprepared the responsibility of the issues of life and death? Is it not better for us to imitate the example of our Continental neighbours, and be provided with experts whose whole life is employed in studies and duties akin to the matter they have to investigate, and who have at their disposal all the talent and experience of the day, and, when required, higher grades of office—inspectors, or by whatever name they may pass—equally, with themselves, members of a public service of health, and attached to the ministry of health and justice, and ready to bring to bear the highest acumen and knowledge to solve those difficult matters which constantly arise in preserving life and determining the causes of death? It is in the interest of the innocent, as well as of the guilty, that some improvement should take place in our present means of inquiring into the problems of health and disease, of life and death, of accident, and of crime.

Who shall determine how much is lost to human life by our failure, under the present desultory system, to acquire for use all the fruits of experience in preventing disease, and ensuring a high standard of national strength and vigour? Draw together all the cords of experience now straggling abroad in every direction, and bind together in one all the sinews of our knowledge, that out of it we may devise means to give fresh endurance and fresh power to the struggling masses of our people. Let this be part of the ministry of the day, and not the most ignoble—a presiding genius of health, whose influence shall be felt in the remotest corner of our land, in the consciousness that help is always ready to be given, to the best of human ability, in every time of difficulty or distress. We improvise something of this kind when a great epidemic calamity is upon us; but hundreds, often thousands, of lives are sacrificed before the machinery is in working order, and when we are really in staunch trim for action the calamity is partially or entirely overpassed. Unhappily, strewn all along its path of progress are to be found the bodies of the victims who might have been saved had our forethought been equal to our pity.

The really difficult matter in any remodelling of our sanitary system is the question of the incidence and amount of rating. The consolidation of offices and officers, all serving one local authority, collecting rates for all purposes, and, therefore, making but one consolidated rate, collected at fixed periods, would of necessity ensure considerable economy, and in many places at present well-governed under the old system, a very large saving would accrue; but in others, now suffering from past neglect, it would inevitably follow that the necessity would arise for further taxation. The true principle, no doubt, in levying moneys for public local purposes is, that every one should contribute in proportion as property is benefited by the money expended. But to determine this is a subtle indeterminate equation, which in many cases defies solution, and the more attention we give to the subject, the more shall we become convinced that all exemptions are vicious and misleading, and that the only safe and equitable guide is to take rateable value as the basis of rateability, and to treat every one alike. It is impossible to say where any person or property is not indirectly, if not directly, benefited by works executed in any district. In the works to be carried out by a Conservancy of Rivers Board, none would be more beneficial than those executed for the prevention of floods—a work which it would be impossible to carry out thoroughly and extensively without an entire representation of all the various interests concerned within the whole watershed area of a river.

One short example of an apparent exemption may show how wrong it is to carry such exemptions into practice. Those persons owning property on the upland portions would strongly urge that they should not be rated, as they could derive no benefit from the works; but it is on account of the position of their property, and the relief they get by a rapid transmission of the water which falls on their ground to the low-lying parts of the area, that the difficulties arise, to remove the liability to which the money has to be expended. Here, however, we are again met by obstacles interposed by our past legislation. The Public Health Act, 1848, and the Acts subsequently passed, have rated agricultural lands, market gardens, water, and railways at but one-fourth of their rateable value, and the great railway companies, wise in their generation, have been careful, whenever a special Act of Parliament has been passed for the improvement of a town or district, to get clauses inserted containing for their protection the same exemptions as are contained in the general Acts. But a closer examination of the subject will show that it is these great companies, lands yielding produce, and the like, which derive the greatest amount of benefit from the improvement of a district; and if they take their fair share of the benefit and profit, they should in like manner be prepared to bear their equal quota of the burdens which improvements entail.

Great apprehensions have been expressed, both in and out of Parliament, at the very large increase of indebtedness of local authorities, but a little examination will tend to dispel any fear on this account. The great body of the expenditure has been incurred in the purchase from companies of their gas and water undertakings, and for the money thus expended there is a commercial and adequate annual return, equal at least to the interest which has to be paid for the money borrowed, and in many cases bringing in a large amount of profit. Judging from the events of the last few years, the time does not appear to be far distant when every prosperous undertaking, paying a good dividend on the money invested in the enterprise, will have passed into the hands of the local authority of the district in which it is situated. This is hardly a consummation devoutly to be wished. Interference with private enterprise, and stoppage of outlets for investment of small sums in secure ways, is contrary to public policy; and every additional dealing with public moneys for trade purposes is to be regretted, as a step in the wrong direction. Happily, the Legislature has, as yet, determinedly opposed any using of moneys raised by rates in competition with the action of trading companies.

After very considerable inquiry and experience, I have not been able to satisfy myself that any advantage can accrue to communities from such transfers. What a local authority could or would do, would certainly be done in its own interest by a gas or water company having parliamentary powers of supply, for the interests of the company and of the consumer, whether of gas or water, are indissolubly bound up together; and Parliament has surrounded these supplies with such safeguards as to make it less than ever desirable that so much of valuable private enterprise as is represented by these companies should be destroyed. The limitation of dividends, the sale of shares by auction, the adoption of a sliding scale, in which dividends are directly proportionate to the cheapness of the supply, the care taken to ensure pure water and pure gas being provided by companies, and the means provided by the Legislature for enforcing this, with the other financial safeguards named, make it less than ever necessary to increase the number of these transfers. There is no further power of supply, no greater aid given to the local authority to enforce the use of water, and, so far as I have been able to judge, no saving to the community. It is true that in the case of water there is the power in the local authority to take the mains, if necessary, through private lands—a privilege not granted to a company—but the occasions for the exercise of this power are so rare as to make it practically worthless.

Of course, it will be argued that the great profits now earned by the companies are transferred to the consumers; but is this so? In the case of either gas or water supply, if compulsory power should be granted to acquire an undertaking—and this, as yet, has only been done in one single case of a water company, and never in the case of gas—Parliament will require the full value of the going concern to be paid for, estimated at 25 years purchase, money being supposed to be worth 4 per cent., and the local authority will also be called on to pay a sum to represent prospective value and compulsory sale. When the sale is by agreement, the company fix their own price. We may therefore assume the undertaking is not parted with below its real value. The only profit to be earned is that arising from the raising of new capital; and as now every gas undertaking must sell its shares in the open market for what they are worth—which in every case is close upon the current value of money—and all the premium obtained goes into the capital, without carrying a dividend, by these means the price of the commodity sold is reduced, and there is practically little advantage on this score. Moreover, it cannot be right in principle to make large profits at the expense of one class of ratepayers for the benefit of others. When a sanitary authority become possessed of a gas undertaking, they can only rightly do so because they have to provide means of public lighting—certainly a very important element among sanitary and social requirements. Private lighting is to be considered, under these circumstances, as merely subsidiary to this public supply, and gas should be supplied at cost price to consumers who are ratepayers, and who take their share of the risk as to the capital sum invested, and have to pay their share of the principal and interest year by year; that is, the undertaking should be carried on to give cheap gas, not to make profits out of which to build town halls, or to provide street improvements.

In another view the change of supply to the hands of public authorities is likely to be disadvantageous. At the present time effective checks to the supply of gas containing any impurity, or of less than standard illuminating power, can be, and are, imposed by the Legislature. For every day in which such gas is supplied a fine is imposed, which can be so arranged as to be a real payment out of the pockets of shareholders, it being levied and paid out of the dividend of the ensuing half year, which is by so much diminished in amount. But it is useless on the part of ratepayers to seek to impose such fines when the undertaking is in the hands of the local authority. Public authorities as yet are only men, and possibly sometimes, when managing gas and water undertakings, may be found in default as to quantity and quality of supply of gas or water. To impose a fine is to punish the sufferer, as it is a payment which would have to be found out of rates paid by the complainant himself.

With respect to water-rates, there is no object in charging more than the actual cost of repayment of the proportion of principal and interest required year by year, because all persons use, or ought to or might use, the water supplied, and it matters little whether the money be raised by a rent charged for the supply, or by a rate charged over the whole district supplied. Where the supply is not universally used, it is often necessary that a rate in aid should be levied to make up the deficiency of the annual charges. There are, no doubt, in this way, great inequalities; but it would be a national disaster in any case to attempt to pay for water like gas, according to the quantity supplied, for that would be to limit the use of a necessary to health, which every one interested in a community wishes should be as large as possible without incurring waste; and rateable value, in this case also, must continue to be the true measurer of payment.

Great relief has been given to local authorities by the extension of time for the repayment of the moneys borrowed for the purposes of gas and water supply, town improvements, and the like—the money now being spread over a period of 70, 80, 90, or even 100 years, repayable by annual instalments or a sinking-fund. This enables many works to be executed which were before impossible, and without hardship will, at the end of the periods of payment, transfer to posterity gas undertakings, if gas be then used for lighting purposes, and water undertakings, if water be then a necessary of life, without burdens, and as a valuable property to the district. To acquire these undertakings when assented to by all parties interested, to acquire lands for sewage outfall purposes, to effectuate street improvements, to carry out the Artizans and Labourers Dwellings Act, to provide further powers for such dwellings being erected, and generally for the execution of permanent works, greater facilities are required by local authorities, and an amendment of the Provisional Order system, now open to very grave objections, would inevitably follow an amendment of the administration of public health.

Never before has so much public attention been directed to these subjects, never so largely as to-day have they received such careful and systematic inquiry, and never has progress been so great as at the present time. We may, then, with the greatest confidence, look forward to the future of our country. An improved standard of national health will lead to higher and better intellectual and moral development, for it is useless to cultivate the brain while the lungs are neglected, and physical improvement must precede mental advance. When our sympathies are enlisted for the poor, the suffering, and the destitute, when we devise better means for their aid, by living among them and showing them how best to obey the law, we elevate while we assist them. We may remember that our sympathy brings its own reward. We take the best step to diminish pauperism when we improve the cottage and surroundings of the labourer. It is, in numberless cases, the illness or death of the bread-getter which adds the name of a family to the list of the relieving officer, and "once a pauper

always a pauper" is too often a sad reality of life. Our wise laws, receiving the most careful and earnest attention, and sure to be amended when an enlightened opinion shall have demonstrated the necessity for further advance, furnish the basis for all external action. We can supplement them by our teaching, our example, our explanation of them, and our help towards their execution by those of our poorer brethren who come within the scope of our influence. It is in the homes of the people we can best show our devotion to our country's good, not as dictators or superiors, but as counsellors and friends. In amelioration of the public health we can all of us play a not unimportant part. It is the province of our Association to promote the amendment of the law, our individual work may well be so to help its application to the wants of the community as to ensure everywhere the means of health, comfort, and education. By our public and private endeavours we may strive to create out of State medicine a religion of the State.

THE MANCHESTER CITY COUNCIL AND THE ELECTRIC LIGHT.

The last Meeting of the City Council for the municipal year was held on Wednesday, the 30th ult.—the MAYOR (Alderman Grundy) presiding.

The minutes of the Gas Committee having been read,

Alderman BENNETT said he wished to ask whether it would not be wise on the part of the Committee, seeing that a discussion was going on respecting the electric light, to pause a little in their expenditure. He did not know how far they might be able to do this, but it was, he thought, desirable that attention should be called to the matter. If the Committee had already entered into contracts which could not be suspended, or if they were of opinion that this commotion about the electric light would prove to be all moonshine, and were therefore determined to go on, of course they would be prepared to take the responsibility. The Council would see that if gas were superseded, it was not only the Gas Committee, but also the Improvement Committee and the citizens generally, who would suffer. The Improvement Committee received £52,000 from the Gas Committee during the past year. Clearly, if the electric light, as a means of illuminating streets and houses, were generally adopted—as some people considered it would be—£52,000 a year would no longer be available for improvement purposes; and perhaps they would have a dead weight hanging upon them for years, in respect of the expenditure already incurred. The Liverpool Corporation were about to test the advantages of the electric light. He did not suggest that they should incur the same expenditure in Manchester, at the same time he thought that they should pause in their outlay on the new gas-works. He had no wish to interfere with the proceedings of the Gas Committee, but thought it necessary to give them a caution, and to tell them that, if the expenditure they were incurring went for naught, the responsibility would rest with them.

Alderman LAMB said that this question had received the attention of the Gas Committee. He was of opinion that there was little or no ground for apprehension. He believed the Committee would always be able to pay 10 per cent. upon their assets, and the time would never come when it would be necessary to levy an improvement-rate. The Gas Committee had been blamed in some quarters for handing over £52,000 for improvement purposes; it was thought this sum should have been given to the gas consumers. But what were the facts? They were supplying 20-candle gas at 3s. per 1000 feet. That was not done by any other town in England; and he asked the Council to remember this: The citizens of Manchester were the owners of the gas-works; the gas consumers were in the position of purchasers, and the Gas Committee were traders. He maintained that the consumers had no right to expect gas at a lower price than they might either manufacture or purchase it for; and the ratepayers, who were not all gas consumers, and had no right to be classed with them, ought to have an advantage by having no improvement-rate to pay, because the rates always guaranteed the gas loans.

Mr. W. SMITH expressed his confidence in the success of the electric light, and thought it would be highly politic on the part of the Gas Committee not to enter into fresh contracts.

Alderman CURTIS said he had no fear whatever but that the Gas Committee would be able to hand over as large a sum for improvement purposes as they had hitherto done. From 1862 to 1878 inclusive, in addition to paying a large amount to the Improvement Committee, they had paid off out of profits, in liquidation of the mortgage debt, a sum of £404,588. That was within a few thousands of the amount paid to the Improvement Committee, which was £511,780. If, therefore, the electric light should prove successful, the Committee, having saved money, would be in a better position to meet the change when it came. He was not very apprehensive that the change would become universal. The new light might be applicable to large open spaces, though he had not been very favourably impressed with the experiment he witnessed in Paris; but even then the cost, in his opinion, would be greater for the same amount of light than for gas.

Mr. HARWOOD said that a resolution moved by him, and adopted by the Gas Committee, would show that they were quite alive to the importance of this question. It was—"That the attention of the New Works Sub-Committee be called to the electric light, and that the south side of No. 1 section retort-house be not proceeded with without a special report to this Committee."

Mr. GOLDSCHMIDT said it was a poor compliment to the Gas Committee to suppose that they had not paid attention to the electric light. Still, however complete the success of the light might be, the Committee could not stop the progress of their works, because, having reached the limit of their producing power, it was necessary to provide for the annually increasing demand for gas.

Mr. STEWART said the Committee had resolved to withhold orders for machinery for the new works not already under contract.

Alderman KING (Chairman of the Gas Committee) said he was not surprised that this question should have been introduced into the Council. He could, on behalf of the Committee, assure Alderman Bennett that they had most anxiously noted the information which had been spread about, for some weeks past, on the subject of the electric light; but they could take no definite position, as might well be supposed, until it was known what effect recent inventions might have upon the consumption of gas. It was a matter of very serious importance. When the Gas Committee became the Lighting Authority of the city, they would have to consider very carefully whether some experiment might not be tried in the large thoroughfares. If at any time the electric light should supersede gas for general illuminating purposes, the supply of the light would still be in the hands of the Corporation, yielding a profit; for it was not to be supposed that strangers would be allowed to come into the city and interfere with their streets for any purpose. He had not yet come to the conclusion that the days of gas were at an end. At the same time, the Gas Committee would exercise care and watchfulness, not stretching out their hands farther than was necessary; but up to a certain point they were bound to go.

The minutes were then confirmed.

THE LEEDS GAS COMMITTEE AND THE SUPPLY OF GAS-STOVES.

At the Meeting of the Leeds Town Council, last Wednesday—the MAYOR (Alderman Carbutt) presiding—the question of promoting an Improvement Bill in the next session of Parliament was under discussion. After agreeing to clauses to enable the Council absolutely to acquire, for the purpose of public recreation, Hunslet MOOR, and to make provision for the purpose of extinguishing certain common rights (if any) over Woodhouse Ridge, the question of the supply of gas cooking-stoves was gone into.

Alderman BOWER, Chairman of the Gas Committee, moved that the Council take powers in the Bill to provide gas-stoves for heating, cooking, and other purposes, and to let the same for use to the consumers of gas, either with or without charge, as the Council may determine. He said that if this resolution were carried, it would be a great benefit both to the Gas Committee and the public. At present the Committee had to keep up a sufficient plant to supply the requisite quantity of gas used in the day or week of the year when the demand was greatest—viz., about Christmastide. The demand for lighting purposes was naturally least in summer, and that was just the season when people would be most likely to use gas-stoves, which were a decided advantage over ordinary fires, both for economy and convenience.

Mr. LUCAS seconded the motion.

Alderman ADDYMAN said that he doubted whether it was within the legitimate province of the Corporation to provide the means of cooking food. Let the Gas Committee be content with supplying good gas at as cheap a rate as possible; or, if it were within their power, let them first dispense with the charge made for meters. He thought the resolution introduced a most dangerous principle.

Mr. LYND said it was only intended to offer cheap stoves for the purpose of educating the poorer consumers as to the economical and other benefits of using gas for cooking purposes. The Gas Committee had nearly a million pounds sterling sunk in the means of providing gas, and he thought that if they could induce people to use gas more largely at the time of the year when there was the greatest diminution in the consumption for ordinary illuminating purposes, they would be acting in a commercial and judicious manner.

Mr. WILKINSON remarked that the electric light was now staring them in the face, and he did not doubt that it would take the place of gas in certain localities. The Gas Committee ought, he thought, to be empowered to make use of the plant, for which they had paid a million of money, for whatever purposes would be best for the community. He hoped the Council would concede all that was asked for.

Alderman GALLSWORTHY opposed the proposition, believing that the whole principle of the thing was wrong. The Corporation might as well provide chandeliers as stoves. He protested entirely against the voting of money for such a purpose.

Mr. HARLAND said that he had not the slightest objection to stoves being used, but he thought the Committee had exhibited an amount of weakness in bringing the resolution before the Council, and stating, as one of their reasons, as Mr. Wilkinson had done, that they might have the electric light to compete with. He would say to the Gas Committee: "Wait till the electric light has been proved to be superior, and has been introduced, and if it is then found that a profitable investment can be made by cooking people's food instead of lighting their dwellings, the Committee should go on with their proposition." He thought it was not a very wise one, and ought to be rejected.

Mr. MOODY supported the resolution. He said he had no doubt that if they could, at an expense of 2s. each, provide the working classes with stoves, they would be able to equalize their summer and winter production of gas.

Mr. BAKER remarked that, if they passed the resolution, they would be taking the stove business out of the retailers hands, and he did not think the retailers in Leeds should lose any of the profits which fairly belonged to their business.

Alderman GAUNT said that in this matter he had no particular respect either for retail traders or wholesale traders. If the matter was for the benefit of the people, or for their own benefit, he would go in for it. This resolution gave the Council the power—and he thought it was advisable, if they could, to get the power—to do anything. Whatever people might say, there was no doubt that the electric light was looming in the future, and it would to some extent—he did not think to any great extent—make valueless the plant of gas-works. Now, he thought attention should be directed to the use of gas in other ways, and he saw no reason why gas should not be used in cottage houses for cooking as well as for lighting. There was no reason why they should not pass the resolution.

The MAYOR said he was sorry to have to oppose the resolution of the Committee, but it was counter to the true principle of local self-government, which was, to do nothing for a man that he could do for himself. He might as well tell the Council that the Committee had actually ordered 5000 of these stoves, but they had since taken the opinion of counsel, and, finding they had no powers, they came to the Council to obtain such powers. Why should the Corporation go on as if they were a company of small shopmen? It was said that the interest on these stoves would only be 1½d. each, but he should like to know what would be the cost for repairing them. He was sure they would find that gas-stoves required repairs much oftener than meters did.

Mr. FIRTH supported the resolution. He said that the Mayor's principle, if fully carried out, would equally prevent the Gas Committee from supplying meters, which the consumers could themselves obtain at less prices. He thought it would be unwise if the Committee should wait until the electric light superseded gas, before they took means to utilize their plant as fully as possible.

The TOWN CLERK explained that when the Gas Committee passed the resolution he had advised that it would be *ultra vires* to employ corporation funds for any such purpose whatever. He suggested that counsel's opinion should be obtained, and that had been done, and the only way in which action could be taken was by application to Parliament.

Alderman BOWER, in reply, said that in some other large towns the Corporations were providing such stoves to those who applied for them. The Gas Committee would not buy these stoves of any one tradesman, but would advertise, and any tradesman in the town could tender for them.

The motion was then put and carried by 33 votes to 17.

Alderman BOWER next moved for power to amend sections 24 and 26 of the Leeds Corporation Gas Act, 1870, by authorizing the substitution of a London standard Argand 24-hole burner for a 15-hole burner, for the testing of the illuminating power of the gas supplied by the Council.

Mr. LUCAS seconded the motion.

A discussion followed, during which several members objected to any change which might facilitate a reduction in the quality of the gas.

Upon being put to a division the motion was lost, not being supported, as is necessary in an application to Parliament, by a majority of the whole Council.

LIVERPOOL TOWN COUNCIL.

At the Meeting of the Town Council last Wednesday—the MAYOR (Mr. A. B. Forwood) presiding,

Dr. CROSS moved the adoption of the report of the Special Gas Committee, as given in the JOURNAL of the 22nd ult., p. 600. He explained that, although it was his duty, as Chairman of the Committee, to move its adoption, he did not at all agree with the report.

Mr. CONNOLLY seconded the motion.

Mr. PEET moved, as an amendment—"That the report be not approved; and that, having regard to the recent discoveries with respect to the electric light, the Council consider it advisable to postpone for the present the consideration of the advisability of purchasing the undertaking of the Liverpool United Gaslight Company." He described the combined action of some of the members of the Committee in order to get the report agreed to, and, as he contended, virtually to pass a vote of censure on Dr. Cross, the Chairman, to whom, he said, all the credit was due for whatever had been accomplished.

Mr. HUGHES seconded the amendment.

Mr. PICKTON pointed out that there was very little difference between the report and the amendment.

The TOWN CLERK: Look at the preamble of the report.

Mr. PICKTON: But the preamble is mere verbiage.

Mr. M'DOUGALL supported the motion for the adoption of the report, on the ground that nothing had been done by the Committee, though they had been appointed four years.

Mr. WHITLEY said that no Chairman of any Committee worked harder than Dr. Cross had done for the town. It was easy for Mr. M'Dougall to say that nothing had been done; but a great deal had been done. The Gas Company had been induced to look after their officers, and to improve the quality of the gas, and if only that was obtained, great credit was due to Dr. Cross. The report recommended that the Committee should be dissolved, and an attempt was made to cast an unmerited stigma upon the Chairman and the Deputy-Chairman, who had been very ungenerously and unfairly spoken of, though they had done a great deal for the interests of the ratepayers. He trusted the Council would not sanction such a proceeding.

After some further discussion, the amendment was put and agreed to by 37 votes to 10.

Dr. CROSS next moved—"That the necessary parliamentary notices be given of an application to Parliament, next session, for powers to authorize the Council to take all necessary steps, and execute the requisite works for lighting the public streets and places and buildings belonging to the Corporation within the borough by means of the electric light, and with power to supply such light to any person or persons or companies who may require the same, and for such further powers in connection therewith, or with the gas-works property and undertaking of the Liverpool United Gaslight Company, as may be considered by the Council to be requisite or desirable." He said that if the electric light were to become the light of the future it would be a great saving to the town, but he thought the working out of the experiments would be fraught with the greatest difficulties.

Mr. PEET seconded the motion.

Alderman BENNETT said he objected to spending money upon schemes which might turn out visionary.

Mr. WILSON said he believed the time had not come when there was any necessity to take up the electric light. Moreover, the ratepayers ought to be consulted.

The TOWN CLERK said that it might be necessary to consult them.

Mr. WHITLEY reminded the Council that by adopting the resolution they did not commit themselves absolutely to the electric light, and he thought they should not miss the opportunity of giving the necessary parliamentary notices.

The motion was then carried by 38 votes to 6; some of the members, being Shareholders in the Gas Company, not voting.

Dr. CROSS then moved—"That the sum of £2000 be granted out of the surplus income of the Corporation towards the cost of promoting a Bill in Parliament, containing the requisite powers with reference to the electric light and other matters mentioned in the foregoing proposed resolution, the same being for the public benefit of the inhabitants and the improvement of the borough."

The amount proposed to be expended having been reduced to £500, the resolution was agreed to, as were also the following:—"That the Mayor be requested to convene a special meeting of the Council to consider, and if thought expedient to direct the Parliamentary Committee to promote a local Bill in Parliament, for the purposes mentioned in the preceding motions, and to determine out of what fund or funds, rate or rates, the cost and expenses attending the same should be paid." "That an application be made to the Court of Quarter Sessions for the Borough, at the next sitting, to appoint an Accountant to examine and report upon the accounts of the Gas Company for the year ending June 30, 1878, pursuant to section 35 of the Gas-Works Clauses Act, 1847, and section 40 of the Liverpool United Gaslight Company's Act, 1848." "That the Borough and Water Engineer report to the Council with reference to the electric light and its applicability for lighting the public streets and places and buildings of the Corporation within the borough, and that he be authorized to examine the mode of lighting and appliances now in use in Paris, and to confer with the Engineers of the City of London and of the Metropolitan Board of Works on the subject."

BURY (LANCS.) CORPORATION GAS SUPPLY.

A Special Meeting of the Bury Town Council was held last Wednesday—the MAYOR (Alderman Duckworth) presiding.

The Gas Committee reported that, at their last meeting, it was resolved that the initial price of gas for the ensuing year be 3s. 4d. per 1000 feet, as heretofore, with an allowance of 1d. per 1000 feet for the consumers share of profits for the past year, and a discount of 5 per cent. for prompt payment; and there was read the following statement, proposed to be presented by the Committee to the Council as to the past and present condition of the gas-works:—

The Council, having before them the statement of accounts as prepared by the Secretary, together with the report of Mr. Newbigging, Consulting Gas Engineer, the Gas Committee, thinking it might be of interest to the members of the Council, determined to supplement these with a short statement or *résumé* of their labours during the past two years, during which time important alterations and additions have been, or are being, carried out, which, when completed, will, they venture to think, render your gas-works as efficient as any works of a similar kind.

Statement.

Shortly before the appointment of your Committee, the late Commissioners had reported as to the condition of the works. The following extracts will serve to remind the Council of the condemnatory character of that report:—

"That the present works are deficient, and, in many respects, unsuitable for the purpose.

"That it is desirable to at once secure a site adjacent to one of the railways, to which convenient sidings may be made.

"That every year's delay will put the town to continued and unnecessary inconvenience, and eventually involve an increased cost."

The first act of your Committee was to consider this report, and to make a thorough inspection of the works, after which they entered the following resolution on their minutes:—

"That the report of the Bury Improvement Commissioners as to the state of the gas-works is a faithful and correct representation of the condition of the present works, and as such report contemplates a renovation of the old, or, in the alternative, the erection of an entire new works at an early date, the Committee earnestly recommend the same to the consideration of the Council."

The defects were chiefly threefold—want of storeage room, want of purifying plant, want of carbonizing power.

Fully impressed, as your Committee were at the outset, as to the necessity of a new site for gas-works, yet as, under the most favourable circumstances, new works could not be established within a period of several years, they deemed it advisable to remedy, either wholly or in part, the three principal defects.

Storeage Room.—This want had already been ordered to be met by the late Commissioners, and the work was in hand.

Carbonizing Power.—This it was thought might be improved by alterations in retort-setting, improved draughts, &c.

Purification.—This was so lamentably deficient that nothing less than the erection of new condensers and scrubbers would be of any avail.

Having then determined to forthwith proceed with the completion of the gas-tank and holder, the erection of condensers, scrubbers, coal stores, and other minor matters, involving an outlay of some thousands of pounds, your Committee resolved that it would be advisable first to take the opinion of some gas engineer, and Mr. Newbigging was called in accordingly. At the same time, the Borough Surveyor was instructed to prepare a plan of the existing works, and to survey the following sites of land, and report thereon as to their suitability as to levels, approach roads, size, &c., for the erection of new gas-works—viz.: Hardman's Bottom, Hardman-in-the-Fields, Daisy Field, Openshaw Fold, Warth Fold. Mr. Newbigging having made his report, and having in it endorsed every conclusion the Committee had previously arrived at with respect to the necessity for an improvement in the quality of the gas, your Committee forthwith proceeded to carry out the following works—viz., the erection of new scrubbers, new condensers, new coal stores, and new exhauster, and to complete with all speed the new gas-tank, retaining the boundary walls, &c.

The following is a brief description of these several erections:—

Scrubbers.—These are two in number, 10 feet inside diameter, and 54 feet high; they are fitted with boards and improved machinery for distributing the water. The machinery is protected by a wooden house on the top, and this is approached from the ground by a staircase between the two columns. The total height from the ground to the top of the house is 76 feet.

The design is similar to those in work at Beckton, Blackburn, Bolton, Wigan, and other places. The filling with boards, and the equal distribution of the water by the improved appliances, provides the largest saturated surface possible, and by this means the greatest amount of ammonia will be deposited, rendering the gas purer, whilst the extra price obtained for the ammoniacal water will soon defray the outlay.

Condensers.—These are of the type known as the "vertical annular," being considered the most powerful. They were adopted after careful investigation and consideration of the several forms in use at other works. The columns are of wrought iron, the inner one 20 inches in diameter, the outer one 30 inches in diameter, and 25 feet in height, and are calculated to pass 70,000 cubic feet of gas per hour. They are arranged in two rows of 12 tubes each, with bye-pass valves and connections, so that they can be worked together—each range separately—or the gas may pass by both, according to the quantity being made. By means of this apparatus, the purification of the gas will be greatly improved, rendering the erection of additional purifiers unnecessary.

Coal Stores.—A wrought-iron roof on iron pillars, capable of storing two weeks stock of coal or cannel, has been erected. This it is proposed to extend, at a small additional outlay, to hold three weeks supply.

Exhauster.—This is on the direct pumping system, and is capable of passing 60,000 cubic feet per hour; it is fitted with self-acting bye-pass, compensating valves and governors, and every requisite to ensure a proper and steady flow of gas without the possibility of drawing air, which is the case under present arrangements, and which so often affects the illuminating power.

Gasholder and Tank.—The new holder is telescopic, in two lifts, 120 feet diameter and 70 feet high, and is capable of holding 800,000 cubic feet of gas. The holder is an admirable piece of workmanship. The tank, too, though built under difficulties, some of which tended to destroy its symmetry, so far promises well. The addition of this holder will enable the works to be managed more economically, and will prevent a great amount of anxiety to the Committee, as on one or two occasions more gas has been consumed in one day than there was storeage room for.

The purification and storeage of gas having thus been provided for—matters which, it will be remembered, were absolutely necessary to be done, whether the present works were to be enlarged or a new works erected—and having attended to the several minor suggestions contained in Mr. Newbigging's report, your Committee again reconsidered the question of extension on the present site, or the going for a new one.

To effectually remodel the present works to last for a further period of 15 years, according to Mr. Newbigging's estimate, would cost, including a branch railway, not less than £50,000 to £60,000.

The present site is already inconveniently crowded with plant, the economical working of the same being affected by the want of proper storeage room for coal, cannel, coke, and other materials. Your Committee, therefore, did not feel justified in recommending this large outlay of money on the present site; but, taking into full consideration the increasing demand for the supply of gas to a town like Bury, they still deemed it desirable, in the interests of the Corporation, to provide a new site. The new works would, in the first place, be supplementary, to be extended as required; but would ultimately become the chief station, the present works being reserved for storeage, &c.

Your Committee having decided that it would not be prudent to erect a new retort-house at the present works, determined to improve, as well as might be, the present settings, to erect a new dwarf chimney, and put the roofs in good repair. This work has now been done at a comparatively small cost.

Your Committee are now able to report that, owing to these repairs and alterations, coupled with the covering of coal stores and a more vigilant supervision of stoking which has recently been introduced, the yield per ton of coal and the daily yield per mouthpiece have been materially increased. This, coupled with the great advantages arising from the extra storeage room afforded by the new holder, enabling full charges to be worked at the week ends, has so far increased the carbonizing power of the works as will enable them to meet the wants for several years to come. The introduction of larger mains now going on, which will enable the gas to be supplied at a lower pressure, and the replacing of worn-out service-pipes, will go far to reduce present leakages, and this also will prolong the time the present works will be able to meet the demands upon them.

With the expenditure of a few hundred pounds in erecting additional retorts, the works may now be considered to serve for a further period of five years.

New Site.—The utmost limits the works can be expected to serve being five years, your Committee have been anxious to secure a site of land for the erection of new works, and have been in communication with several owners as to the price of land. Finally, Daisy Field was chosen as the most suitable plot, being favourably situated to the canal, the railway, and the present works. Unfortunately, your Committee have not been able to ascertain the price required for the purchase of this land.

Instructions have been given by the Council to take the necessary steps to procure the parliamentary powers to secure the land named, and the Borough Surveyor is engaged in preparing the necessary plans for that purpose. The Lancashire and Yorkshire Railway Company have consented to the construction of a siding in connection with the railway, on terms to be hereafter agreed upon, and thus far the work of securing an additional site for gas-works is progressing.

Signed on behalf of the Committee,

Oct. 2, 1878. SAMUEL COOK, Chairman.

Note.—Since the above statement was written the Parliamentary Committee have decided to recommend to the Council not to proceed with a Bill in Parliament this year, but to seek the powers required as far as possible by the aid of a Provisional Order.

Your Committee are advised that the powers they require cannot be obtained by Provisional Order, consequently the question of obtaining a new gas site is postponed for another year.

The following is a copy of the report of Mr. Thomas Newbigging:—

To the Gas Committee of the Corporation of Bury.

Gentlemen,—Pursuant to your instructions, I have made a complete inspection of your gas-works, and I am in a position to report, which I now respectfully beg to do, upon their condition, the best means of altering and extending them, the cost of such alterations and extensions, and the length of time they may, when so extended, be expected to serve the town, having regard to the rate of increase in the consumption of gas during the past few years.

The retort-house is not a convenient building, and it is in but an indifferent state of repair. Not only are the walls and roofs too low and confined, but they are in a distorted and unsightly condition. The gable ends are bulged outwards, owing to the expansion of the retort-benches, which are built so as to abut against them. The ven-

tilation is bad, but it would be more imperfect than it is, were it not for the circumstance that portions of the louvre are unroofed and open to the sky.

There are two retort-stacks, containing together 40 benches or ovens, comprising 280 retorts, in settings of seven single D retorts each. Last year the settings were principally fives, and every retort on the premises—viz., 228, was in use during the winter season.

The principal chimney which serves the bench contained in one section of the house, is cracked apparently from bottom to top on its four sides; and even if it may be considered safe without straps to bind it together, it is not in an efficient state for the work it has to perform.

The dwarf chimneys erected over the other benches are too restricted both in their area and height, and consequently are not equal to creating the draught that is required through the furnaces.

The heat of the ovens on each occasion of my visits was generally unsatisfactory. This may be partly due to the method of setting the retorts, but is also in large measure attributable to the imperfect draught.

The quantity of coal and cannel used for producing gas during the year ending March last was—

	Tons.	cwt.	qrs.
Coal (chiefly Wigan)	12,214	7	0, or 74 per cent.
Cannel (Wigan)	4,306	5	0, or 26 per cent.
Total	16,520	12	0

The total yield of gas from the above amounted to 153,945,600 cubic feet, being at the rate of 9318 cubic feet per ton. The maximum day's (24 hours) production of gas was 904,400 cubic feet.

You have no covered storeage room for coal or cannel, the whole of that material, of which there is necessarily a large stock in winter, being stored in the open air, and exposed to the weather. The consequence is that the material is almost always in a humid condition, and very often saturated with water, when thrown into the retorts.

It is scarcely necessary for me to say that coal thus exposed is seriously deteriorated. Not only is it reduced in size, but its gas-producing qualities are sensibly impaired, whilst the resulting impurities, owing to the presence of the moisture, are increased in amount.

The result of these several deficiencies is seen in the low production of gas per ton of coal and cannel carbonized, and in the unprecedentedly small yield of gas per mouthpiece per day.

The former, as already stated, amounts to 9318 cubic feet on the average of the year, whilst the production per mouthpiece is only 3966 cubic feet—a result which I have no hesitation in asserting is much exceeded in every other important gas-works. The small charges of coal that are placed in the retorts partly accounts for the diminished yield per mouthpiece, but the quality of the heats of the retorts generally, is such as will scarcely admit of a greater bulk of material being carbonized at one charge. A low production per mouthpiece implies a heavy fuel account, and increased expense for wages and wear and tear.

From the hydraulic mains over the benches the gas is conveyed by a 12-inch pipe to the condenser. This apparatus, which is in wretchedly bad order, is not capable of condensing more than one-third of the maximum daily quantity of gas manufactured, notwithstanding that a stream of ammoniacal water is kept constantly running through it.

On leaving the condenser, the gas passes through an ordinary washer, which, besides being useless, owing to its small size, is placed in the wrong position. The washer should follow, not precede, the exhauster.

The scrubber, which, in one form or another, is one of the most important and profitable purifying appliances on gas-works (because the ammonia abstracted by it is a source of revenue), is altogether absent. Two of these vessels, I understand, are in course of construction. Their position is after the condenser, or washer, should the latter be employed.

The effect of this deficient condensation, and the want of scrubbing arrangements, is to throw upon the purifiers (which are already sufficiently small to do their legitimate work) the main burden of the purification of the gas from the objectionable products that should be—some of them wholly, and others partially—removed beforehand. The purification, under such circumstances, cannot be accomplished satisfactorily, or, if so, it is at an enhanced cost for material and labour. In your case, the expense of purification is small—under one halfpenny per 1000 cubic feet of gas sold; but this economy has been obtained at a sacrifice of purity.

From the condenser the gas travels by a 20-inch main—recently substituted for one 12 inches in diameter—to the exhauster.

This main, for a length of 150 feet, is laid in a subway, covered with flags, and soiled over. No adequate means for ventilating the subway have been provided, and in the event of an escape of gas from the main, a dangerously explosive compound would be formed. The trench should either be covered with open cast-iron gratings for portions of its length, or it should be filled up solid.

The exhauster is an efficient apparatus; but as it is of the utmost importance that it should be kept at work night and day, during the winter season especially, without intermission, the machinery should be duplicated. Provision has already been made for that purpose. I am aware that there are two other exhausters on the premises, but neither of them is in good condition, and one of them is too small to be of service.

I observe that you have no governor to regulate the amount of the exhaust in the foul main. A few pounds would provide one, and it is an appendage that is absolutely necessary, especially in the present instance, where air is liable to be drawn in through cracks or defective joints in the condensing apparatus.

The fluctuations in the quality of your gas are largely due to the accidental admission of atmospheric air into the holders from this cause, and its presence was distinctly apparent to me on the occasion of my first visit in the evening, after the lighting had begun.

The gas on leaving the exhauster enters the purifiers. These vessels are twelve in number, and divided into three separate groups of four each—viz., two groups of four 14 feet square, and one group of four 12 feet square. These afford a purifying area just barely sufficient to accomplish the purification satisfactorily, provided the other apparatus were all in efficient condition, and of the requisite capacity; but as the reverse of this is the case, the purifiers, as I have already explained, are overburdened; and, consequently, cannot by any possibility be made to perform the duty they would otherwise be capable of doing.

The place assigned for testing the gas with the acetate of lead test, in order to ascertain when a purifier requires to be changed, is radically wrong. This is at a pipe furnished with a stopcock, and connected to the main in the meter-house. It must be evident that when the presence of sulphuretted hydrogen is indicated at this point by the discoloration of the lead paper, the gas passing into the holders is already less or more in a foul state. The proper place for applying the test is at the middle purifier of each series, or at a pipe leading therefrom, and when sulphuretted hydrogen is indicated here, the vessels should be changed.

The station-meters, two in number, seem to be defective in their working, and require overhauling.

The governors, three in number, are in good condition, and of suitable capacity.

You have at present two gasholders (not reckoning the old vessel put out of use), the dimensions and capacity of which are as follows:—

One single holder, 100 feet by 30 feet, equal to 235,000 cubic feet available storeage capacity.

One telescopic holder 100 feet by 54 feet, equal to 424,000 cubic feet, giving a total capacity of 659,000, or about two-thirds the maximum daily (24 hours) make. When the new telescopic holder, 120 feet by 70 feet, in course of construction, is completed, it will add 791,000 cubic feet to the other, making a total available storeage capacity for gas of 1,450,000 cubic feet, which is 60 per cent. more than the daily production. This is in excess of what is requisite, and the telescoping of the vessel might safely have been postponed for a number of years. The inner lift only might have been constructed at present, the necessary provision being made for telescoping when a greater capacity was required.

The inlet and outlet stand-pipes for the new holder should have been 18 and 20 inches diameter, instead of the 14 and 18-inch mains provided for it.

The retaining wall in Victoria Street, the puddle wall, and the new tank wall, taken together, are of a thickness sufficient to resist about double the pressure of water that will be exerted against them, so long as the homogeneity of the structure is preserved. It is of importance, however, that great care be taken to exclude surface water, or any leakage of water from the tank, insinuating itself between the puddle and either wall, as, if this occurred, the consequences might be disastrous.

During my visits I tested the gas for purity and illuminating power. I found traces of sulphuretted hydrogen after the gas had passed through the purifying vessels, and ammonia was abundantly present, as was to be expected from the insufficient condensing arrangements, and the entire absence of scrubbing appliances.

The illuminating power of the gas, as indicated by the jet photometer, was equal to 19 sperm candles, or 7 candles beyond the minimum prescribed by the Act.

The somewhat lavish expenditure now being incurred for main-pipes will ensure the consumers an adequate supply of gas for many years to come.

Judging from the small proportion of unaccounted-for gas, amounting during the year ending March last to only 6·53 per cent. (and in this is included the consumption on the works), I conclude that the mains and service-pipes throughout the town and district are generally in good order. I can sincerely congratulate you on this remarkably small per centage of loss, which is surpassed in but few places in the kingdom. The comparatively small cost of your production per 1000 cubic feet of gas sold, and, of course, a considerable per centage of the profits, are attributable to this fortunate state of things. The enlargement of the mains now in progress will enable you to reduce your initial pressure, and still further to economize in this direction, and to this I commend your especial attention.

The renewal of all wrought-iron service-pipes which have been in use over 15 years (of which I understand there is a considerable number) should be systematically undertaken with the same object.

If I might sum up in a few words the position of the gas manufacture and supply, I would say that the holders and the subsidiary apparatus on the works, and the mains outside, are generally in good order, whilst the more important manufacturing appliances, and the primary arrangements and apparatus for purifying the gas, are as defective as can well be imagined, and that a judicious expenditure is urgently needed to put matters in these respects into proper shape for effective working.

Taking into account the difficulties that have had to be encountered, it is evident that care and vigilance have been evinced in the management.

Having dealt with the condition of the works, I beg now to submit a plan (accompanying this report) showing what extensions may be carried out on the present site, in order to utilize it to the best advantage.

I have pointed out the faulty arrangements of the existing retort-house, and the drawbacks resulting therefrom. In my opinion there is no remedy for the defects indicated, short of taking down the present fabric, and erecting another building upon the site.

Before doing this, however, I recommend that a new retort-house be built on the vacant land at the southerly end of the site. This may be equal to the present house, in so far as the number of retorts is concerned. Such a house I have shown on the accompanying plan. It contains two stacks of ovens, ten double ovens in each stack, with seven through retorts 20 feet long in each oven, or a total of 280 mouthpieces. I advise that the erection of this building be commenced as soon as the necessary drawings and specifications can be prepared.

The benches should be fitted with the latest improvements in hydraulic mains, connections, and valves, and retort-mountings generally, and a better system of retort-settings introduced.

After the building referred to has been completed and got to work, the existing house might be taken down, and another retort-house, containing a bench with twelve ovens, or 168 mouthpieces, erected in its place.

The two houses together would contain a total of 448 mouthpieces. From this total number of mouthpieces available, 10 per cent., or say 42, should be deducted as a surplus for use in case of emergency. The remaining 406 would be capable of producing, say, 2 million cubic feet of gas per day of 24 hours, and this might be taken to represent the maximum manufacturing power of the works.

The storeage capacity for gas in a town like Bury should be equal to at least eight-ninths of the maximum daily production. This capacity can be readily obtained at any future time, when the exigencies of the demand require it, by erecting a fourth gasholder, on the portion of land reserved for that purpose, on the north side of the Mucklow Road.

It is of the utmost importance that covered stores for coal should be provided. These should be equal to containing six weeks stock of material, reckoned on the largest daily consumption. This may be taken at 200 tons when the works are fully developed; then, 200 tons by 42 equal 8400 tons.

This capacity is provided for in the plan submitted. I propose that a store, 456 feet long and 30 feet wide, be erected along the entire length of the westerly boundary of the site, and parallel with the road, for convenience in discharging the carts bringing the material. This would contain 7400 tons. The remaining quantity of 1000 tons I propose should be stored in the two sheds alongside of the retort-house containing the single bench of retorts.

The whole of the material thus placed under cover would be conveniently situated for barrowing to the retort-houses, and whenever a branch line is brought from the railway to the works, the stores would be accessible for trucks, which could be expeditiously and cheaply unloaded in bulk.

There are no engineering difficulties in the way of constructing this suggested branch line from the nearest point of the railway to the works. It resolves itself simply into a question of cost.

The advisability of carrying out the project is worth your serious and early consideration, as it is scarcely likely that the chances of constructing it more economically will improve by postponement.

The position of the condensing, scrubbing, and purifying apparatus for the maximum gas make is shown on the plan; and the extensions may be carried out as required.

The present well for containing the tar and ammoniacal water would be contracted in dimensions by the erection of the foundations necessary for the condensers and scrubbers; but the old gasholder-tank in proximity thereto may be utilized for the same purpose. This would be underneath the floor of the purifying-house, and would not interfere with the arrangements overhead.

The new purifying-house I propose should be a two-storied building, the purifying vessels to be placed on the first floor, and the space underneath used for the storeage of lime, and the revivification of the oxide of iron and other purifying material.

I estimate that the alterations and extension of the retort-house, the coal stores, and the condensing and scrubbing apparatus, which are immediately required, will necessitate an outlay of about sixteen thousand pounds (£16,000).

The erection of the new purifying-house, the third scrubber, and the second condenser, may be postponed for a time, and the fourth gasholder will not be required for many years to come. The whole of the proposed extensions (the branch line excepted), when carried out, will involve, at present rates, an outlay of about forty-five thousand pounds (£45,000).

The increase in the consumption of gas during the ten years ending the 24th of March last has been at the average rate of 6 per cent. per annum; during the past five years at 4¾ per cent. per annum. You are better able than I am to form a judgment as to the probable future growth of the town and district; but, judging from what I know of the progress that is being made at the present time, I am of opinion that at least the latter rate of increase will be maintained. Estimating the increase at 5 per cent., the works carried out in the manner proposed will serve for a period of about fifteen years.

I have the honour to remain, gentlemen, your obedient servant,

THOMAS NEWBIGGING.

5, *Norfolk Street, Manchester, Nov.* 23, 1877.

It was resolved that the above be approved and adopted, and a copy sent to each member of the Council. The monthly return showed that the quantity of gas sold for the period ending Oct. 17, 1877, was 158,044,200 cubic feet; and during the corresponding period of 1878, 159,659,300 cubic feet; showing an increase of 1,615,100 cubic feet, or 1 per cent. The gas sold from March 24 to Oct. 17, 1877, was 53,245,100 cubic feet; and for the corresponding period of 1878, 56,574,600 cubic feet; showing an increase of 3,329,500 cubic feet, or 5¾ per cent. The gas sold for the month ending Oct. 17, 1877, was 9,441,900 cubic feet; for the corresponding period of 1878, 10,253,200 cubic feet; showing an increase of 811,300 cubic feet, or 7¾ per cent. The average illuminating power of the gas from the 27th of September to the 7th of October, inclusive, was 18·7 candles, each consuming 120 grains of sperm per hour. Maximum, 19·4; minimum, 18·0.

The MAYOR moved the adoption of the minutes of the Committee.

Alderman COOK, in seconding the motion, said: I wish to make a few remarks upon matters arising out of the minutes, especially as this is the last Council meeting before the appointment of the new Committee for the ensuing year. The Council are aware that a great deal of interest has been taken in these works, and charges have been made against the Committee, that they wished to keep things dark, and to let the Council and Ratepayers know as little as possible about them. The Gas Committee, therefore, resolved, before resigning their charge, to place before the Council an account of their labours during the past year, also as full an account as possible of the true state of the works at the present time. Hence they decided to print and circulate Mr. Newbigging's report, and to supplement it by one of their own, and to send a copy to every member of the Council. If the members have studied these documents, they will see that the Committee have not been idle; and I venture to think they know more about the gas-works to-day, as to their state and capabilities, than they ever knew before. Of course, there remains a great variety of details into which it is unnecessary at this time to enter; but I may observe that there is still a great deal of important work to do, which will require an immense amount of labour and care to carry out success-

fully. Those gentlemen who have carefully studied Mr. Newbigging's report, and compared it with the revenue account of the works, will be at a loss to understand how he makes it out that the gas unaccounted for is only about 6½ per cent.; but the Council must bear in mind that his remarks refer to the previous year. The loss during the last year has been much greater, and this has arisen from a variety of unforeseen causes, over which the Committee had no control, the principal of which were—first, a set of bad retorts, which, after they were got to work, it was found would not stand the heat, but cracked and split to such a degree that a large per centage of gas escaped into the flues notwithstanding the constant repairs which were going on. It may properly be asked why we did not pull them out, and replace them with others. The answer is, we could not do so, because it required every retort we possessed at the time to supply the demand. Secondly, the subsidence of the ground, owing to the excavations for the new gasholder-tank. This was on a large scale, and at one time the ground gave way so much that there was a danger of the sides falling in and bringing down the adjoining gasholder. Of course, this subsidence caused the gas-mains to settle down, and they had to be suspended by chains to balks of timber, to prevent a complete breakdown; but the joints were broken, and a large escape of gas was the consequence. Again, we had a 6-inch main broken on the Croston Road, and the gas was escaping into the sewers for about six weeks before the place could be found. Then we had two explosions—one in Parker Street and the other at Openshaw Fold, caused by the breakage of mains. The loss from these causes was very great, but how great we cannot tell, because the station-meter was out of order and did not register correctly. But most of these things are now remedied, and all in much better order to commence the year with than was the case last year. The Manager estimates that the make of gas for the year has averaged 9000 cubic feet per ton of coal, which, of course, is a very low average, but which is accounted for in the way already described, and for the want of a covered shed for the coals. The amount of coal and cannel used was 22,260 tons. Gas made, or at least registered by the station-meter, 194,281,700 cubic feet. But this is not at all reliable, because the station-meter was stopped about six weeks for repairs. I may observe that, at present, we are getting much better results, and obtaining over 10,000 cubic feet of gas per ton of coal, and we have every reason to believe that this will be kept up during the current year. The Council are aware that, in view of the present gas-works being too small for the prospective supply of the borough, it was deemed desirable to look out for a new site on which to erect larger works, but this for various reasons has been postponed, and in the meantime a new luminary has burst upon the world, which may cause it to be postponed *sine die*. I refer to the electric light. Of course there are various opinions as to its value and suitability for the lighting of streets and dwelling-houses. I have watched its progress with much interest, and have carefully read the reports both for and against it, and I have arrived at the conclusion that it will ultimately succeed and come into general use. I find that Mr. Edison's patents have already been secured in England, and some gas companies are making application for licences and parliamentary powers to use electricity themselves, and supply it to the public. Already two or three companies have been formed for this purpose, and it may be advisable for us to apply for the right to use it, so that in case it proves a success we may avail ourselves of its advantages, instead of letting it drift into the hands of a private company. Therefore I think it would be folly at present to proceed with new gas-works; but other grave questions arise out of this state of things. Suppose this brighter light should extinguish the gas, what would be the value of our present gas-works? or, in other words, what have we wherewith to repay the £107,000 we have borrowed on mortgage? I am afraid the gas consumers will not be willing to pay their moiety towards it; on the contrary, it must come out of the pockets of the ratepayers. The question has sometimes been asked: "Who has paid for the gas-works?" The fact is, nobody has paid; the whole amount is still owing. But it may be asked, "Have we no reserve-fund to meet it? Have we no sinking-fund?" Yes; we have a sinking-fund of 2 per cent. upon the borrowed capital; but it has not been kept up, and it stands to-day in the bank at £9708, and this to meet a liability of £107,000. To my mind, this is not a satisfactory state of things. Besides, I maintain that 2 per cent. is altogether inadequate to meet the depreciation of a perishable plant like the gas-works, and to pay off the mortgages. I have not lost sight of the fact that repairs are paid for out of revenue; but I think that a larger depreciation-fund should be created, if our model Gas Act will allow it. Gas profits have not been properly estimated. I beg to call your attention to the sinking-fund account, and there you will see that about £10,000 has been taken from this fund during the last seven years, and no interest has been allowed for the use of it. Now, this at 4 per cent. will make something like £1000, which ought to have been taken from the gas profits before the balance had been struck. My object in pointing out these matters to the Council is, that a correct idea of the position and liabilities of the gas-works may be formed, and that some better provision may be made to meet these responsibilities.

A somewhat stormy discussion ensued, in which the action of the Gas Committee was called in question, but after the MAYOR had replied to the remarks which had been made, the minutes were confirmed.

THE PURCHASE OF THE EXETER GAS-WORKS BY THE CORPORATION.

At the Meeting of the Exeter Town Council on Wednesday, the 23rd ult.—the MAYOR (Mr. H. D. Thomas) in the chair—the Parliamentary Committee presented a report stating that they had met on the 28th of September to consider certain resolutions which were passed by the Directors of the Gas Company at a meeting held on the 24th, and read at the last meeting of the Council. [See JOURNAL for Oct. 1, p. 491.] Having considered these resolutions, they appointed the Mayor, Alderman Lloyd, and Messrs. Hughes and Owen to wait upon the Directors of the Company to settle the terms of agreement for the purchase of the works, on the basis of the resolutions passed at the last meeting and the subsequent resolutions of the Directors. For that purpose a conference between the Sub-committee and the Directors was held on the 1st of October, when the heads of agreement prepared in London were discussed, and the following modifications therein were agreed to:—1. That the time for completion of the purchase should be extended to one month from the date of the Royal Assent. 2. That the Council should pay a deposit of £20,000 on account of the purchase, with interest, reserved at 5 per cent.; it being an understanding that no more should be charged for the use of the money than was actually paid by the Council. 3. That the Council should nominate four members to sit with the Board of Directors until the completion of the purchase, but without voting power; and that in the event of their raising, at any time, an objection to any item of expenditure proposed by the Directors, the question whether such expenditure should or should not be made, should be left to the determination of Mr. R. P. Spice. 4. The Company to petition against the Bill, for the purpose of obtaining *locus standi* and assisting the Corporation. It was mentioned at the conference that the amount by which the Company were indebted to their bankers had been entirely spent in the erection of new works and the purchase of land.

Mr. S. PEARSE moved that the four gentlemen named in the report, as having been in communication with the Gas Company, be appointed to sit with the Directors of the Gas Company.

Alderman COOPER seconded the motion.

Mr. ANDREW asked whether the Committee, having power to act, had really entered into a contract for the purchase of the gas-works.

The TOWN CLERK replied that the Committee, when in London, fully delegated, agreed to enter into a contract, and their action in this respect was confirmed by the statutory majority of the Council.

Mr. ANDREW: And absolutely committing the Council?

The MAYOR: Absolutely.

Mr. COURTNEY believed that the contract could not be carried into effect absolutely, until there had been a public meeting of ratepayers to confirm what the Town Council had done.

The TOWN CLERK said there would, in due course, be a meeting of the owners and ratepayers.

Mr. COURTNEY: And if they do not confirm, what will be the effect?

The TOWN CLERK: It will then be a question whether the Council will go on with the Bill. The effect would be to prevent the costs incurred in promoting the Bill being thrown upon the rates, and the Council would have to fall back upon the undertaking for the expenses.

Mr. ANDREW: Is the public approval necessary to the final completion of the purchase?

The TOWN CLERK: Under the provisions of the Municipal Corporations (Borough Funds) Act, 1872, it is necessary that there should be a statutory meeting of owners and ratepayers held, to approve or disapprove of the course taken by the Council, before any portion of the charges incurred can be thrown upon the rates.

Mr. WILKINSON: Has there been any good reason why the meeting of owners and ratepayers has not been called before this time? And will a meeting be called very soon?

The TOWN CLERK: There are many good reasons. For instance, one is that we have only just got the modification of the agreement which was settled in London. I propose to have a meeting called as soon as the public business will allow it.

Mr. BROWN: If there is a majority against us, will that prevent us proceeding?

Mr. S. PEARSE: In other words, can we back out of it?

Mr. WREFORD: In what position would the Council be placed, supposing, after an adverse vote of owners and occupiers, the Council did not proceed with the Bill?

The TOWN CLERK: If the Council did not proceed, they would be placed in a position of grave dishonour; and I am not prepared to say that a Court of Equity would not enforce the specific performance of the contract.

Alderman NORRINGTON said the Council knew that they had entered into a preliminary agreement, but all the time it was understood that what was done was subject to the approval of the ratepayers. It was well-known that there were certain contingencies, and if those contingencies could not be met the parliamentary agreement would fall through. He did not see that there would be any dishonour in backing out of it.

The TOWN CLERK said it was understood, when the Committee were in London, that the agreement would be subject to ratification by the Council and the Shareholders of the Company, on their return to Exeter.

Mr. WILKINSON maintained that if the Council took the step recommended by Mr. Pearse they would be further committing themselves. He thought it would be better to postpone such action until after the Council were in a legal position to properly carry out their contract. He moved an amendment, that the appointment be deferred until after the ratepayers had met.

Alderman BUCKINGHAM, in seconding the amendment, said the Council would be placed in a very awkward position if the ratepayers did not approve of the agreement which the Council had entered into, but he had full faith that the citizens would give their support to what the Corporation had done. He certainly understood that everything they had done was, however, subject to the assent which the Act of Parliament required.

Mr. OWEN thought it highly desirable that the opinion of the ratepayers should be taken at the earliest possible moment.

Mr. S. PEARSE hoped the Council will not be shilly-shallying about the gas-works. It seemed to him they had gone so far, and now they were frightened by the electric light, and wished to back out of their agreement. If the ratepayers did not give their assent, the Council could get the money to pay the costs elsewhere. He asked the Council to adopt his motion, if only to show the Gas Company that they were in earnest in their intention to purchase the works.

Alderman LLOYD considered that the Council would be making fools of the Committee if they did not now support them in what had been done. It seemed to him that there was an attempt to repudiate the purchase.

Mr. ANDREW said that he did not gather, from what had been said, that there had been any attempt at repudiation. It would not be right if the Council, having given power to the Committee, did not support them. If the sanction of the ratepayers were refused, he took it that the Council would be absolved from all responsibility in the matter. It was undesirable for the present that the Council should further commit themselves.

Mr. JONES said it seemed that the discussion had been raised at the last moment in order to agitate the public mind. It might be given out that the Council were not satisfied with what they had done.

Alderman COOPER reminded the Council that the Gas Company had applied for powers much greater than they had hitherto possessed.

The MAYOR added that if the Council did not purchase the works, the Gas Company would have such powers as the city would afterwards rue.

The TOWN CLERK: To anticipate failure is to court it.

Mr. WILLEY: And, on the point of honour, the Council should have the fullest confidence in the Committee.

The MAYOR: The action of the Committee has been confirmed almost unanimously by the Council.

Alderman COOPER: And by the city.

Alderman RICHARDS said he could not understand why the Council were to be swayed to and fro by a little scare. Supposing the electric light was all that it was said to be, let them come back to the proposition that the gas-works were worth the money they were to pay for them. It looked as if they were wavering in their minds; but he was not shaken one jot in his views as to the propriety of purchasing the works.

The amendment having been withdrawn, in order that it might subsequently be put as a substantive motion, Mr. Pearse's proposal was adopted by 20 votes to 2.

Mr. Wilkinson's motion was thereafter put and lost by 13 votes to 9, and the Council adjourned.

BRADFORD CORPORATION WATER SUPPLY.—In the annual report of the Water-Works Committee, presented at the meeting of the Bradford Town Council last Tuesday, it was stated that the income from the sale of water, which went up steadily from 1856, and was £78,474 in 1876, decreased in 1877 to £77,106.

KEIGHLEY LOCAL BOARD GAS SUPPLY.

At the Ordinary Monthly Meeting of the Keighley Local Board, held on Tuesday, Oct. 22—Mr. E. S. BRIGGS in the chair—the Gas Committee recommended, in order to the increase of the consumption of gas during the daytime and in summer months, that they be authorized to purchase, sell, and let out on hire, gas stoves and ovens; and that a sample of each kind be procured and fitted up for the purpose of allowing inspection.

Mr. HOULDSWORTH moved, and Mr. GLEDHILL seconded, the adoption of the report.

Mr. J. LAYCOCK, the Gas Manager, in response to a request for some further explanation of the intentions of the Committee, said that their object was to increase the consumption of gas. In summer, 100,000 feet per day were manufactured, while in winter the production reached 700,000 feet. The same plant was required for the production of each supply, and the Committee thought if they could utilize the plant more in the summer they would be able to lower the price. A great many towns were adopting the mode recommended, and heating by gas was cheaper than heating by coal, inasmuch as the heat could be obtained almost instantaneously, and stopped as quickly.

Mr. FIELDHOUSE said that for his part he believed in keeping out of this speculation, and lowering the price of the gas at once, as an inducement to larger consumption. He wanted ironmongers to be ironmongers, and local boards to be local boards. He suggested that the Committee should get one stove of each size, and put it in operation, for the inspection of those who wished to see it.

The CLERK remarked that this was the recommendation of the Committee.

Mr. FIELDHOUSE characterized the hire and purchase system as "the style of Jews." The Committee would, he contended, have to lower the price of gas shortly, for people would not want any when the electric light came into use. Meanwhile, he wished the Manager to have his eyes open to the electric light; as it would be folly to lay out money which would very soon have to be thrown away.

Mr. LAYCOCK said there had been a number of exhibitions of gas-stoves, and recently a very successful one was held in Birmingham. There the hire and purchase system, at three and five years, was being adopted. The Crystal Palace District Gas Company were the first to introduce it some four or five years ago, and they had hundreds of gas ovens in use at the present time. They stated, in one of their reports, that it was the great means of enabling them to reduce the price of their gas. The cost of the stoves varied from 16s. to £10. It was not the intention of the Committee to keep a stock in hand, but simply a number of samples. The Leeds Gas Committee recommended the Corporation to present each consumer with a small hand stove, in order to increase the consumption, and reduce the price of gas.

Mr. FIELDHOUSE disputed the power of the Board to become ironmongers.

The CLERK said that the Act of 1824, under section 38, made it lawful for the Board, after sufficiently lighting public places, to let out to any person any light or burner, and to supply the same with gas at such times as they should think proper. It was, he thought, quite clear that they had the power to supply gas for cooking purposes, but it was questionable whether they were entitled to supply stoves.

Mr. FIELDHOUSE moved, as an amendment, that no stoves be offered at all by the Board.

The amendment was not seconded, and the motion being put to the vote was carried.

Mr. LAYCOCK read an extract from his annual report, showing that, during the past year, £265 worth of coal less than in the preceding year had been carbonized, and £468 worth more of gas had been manufactured. There had been an increase of 467 consumers during the twelve months, and the actual cost of gas sold in 1877 was 25·3d. per 1000 feet, while in 1878 it was 23·9d. With comparatively little extra expense, the producing power of the plant could, he said, be doubled, and to this end he suggested the use of gas-stoves.

Mr. SELLERS said it seemed to him that the Board were throwing a large amount of money away, and that the town was losing a great benefit. They were told that they might double the production of gas at very little expense. He thought the Gas Committee might bestow a great boon on the public by making the price of gas lower, and he did not think they would suffer in the long run. Shopkeepers were keeping down their consumption, and if gas were cheaper he could see there would be a different state of things.*

Mr. HARDWICK thought that the Gas Committee were using their best endeavours to induce a larger sale.

Mr. FIELDHOUSE gave notice of a motion to rescind the resolution just passed, and the other business of the Board was then proceeded with.

THE STOCKPORT NEW GAS-WORKS.

Last week, we gave an account of the opening, on the 24th ult., of the new gas-works of the Stockport Corporation at Portwood; and, as promised, we now furnish a description of the works, prepared by the Engineer, Mr. J. Jacques, from whose designs and drawings they have been entirely erected.

The main entrance to the works is at the bottom of Fernley Street, on the south side of Great Portwood Street, where the lodge and weighing-machine are built, and over which it is intended that all articles going into or coming out from the works will be weighed.

At the bottom of the main roadway, and at right angles to it, is the retort-house, which is 145 feet long and 64 feet wide inside the walls, and 30 feet in height to the springing of the roof, which rises 22 feet to the ridge or apex, being carried to this height for the greater facility of delivering the smoke and steam arising from the coke when drawing and charging the retorts, and for the comfort of the stokers attending the retorts. There is built in the centre of the retort-house, running the whole length, a retort-stack, which at present contains twelve benches or ovens of retorts, each bench or oven being composed of five retorts 9 feet 6 inches long, making 60 retorts; and also archways for a similar number, which will be built as they are required, making a total of 120 retorts, capable of carbonizing 75 tons of cannel, and making on an average 750,000 cubic feet of gas per 24 hours. The roof over the retort-house is entirely of wrought iron; and, for the conveyance of the smoke and vapour from the coke when drawn from the retorts, there has been constructed on the roof four wrought-iron ornamental smoke-shafts, each 19 feet long, by 16 feet wide, and 23 feet high at the springing of the roof, and from the yard level to the top of these is about 75 feet, so that the smoke and vapour will be delivered into the atmosphere at a great elevation, thereby avoiding any cause for complaint from surrounding property owners. The paved portion of the yard, which runs parallel with the front of the retort-house, is for the reception of the coke when drawn from the retorts by the stokers. To maintain the very necessary high heat to properly carbonize the cannel in the retorts, there has been erected at the south-west corner of the retort-house a large octagon chimney-shaft, 66 yards high from the yard level, in the interior of which has been built, entirely of fire-bricks, a circular chimney about 25 yards high, and 10 feet diameter in the clear, leaving a cavity between the outside and inside chimney. The chimney is surmounted by an ornamental terra-cotta moulded cap, weighing upwards of 50 tons, and protected by a lightning conductor, made of copper wire ⅜-inch diameter; and on account of the silty and filled-up nature of the ground, it was found necessary to excavate to a depth of 15 yards to obtain a satisfactory foundation. The temporary cannel-sheds or stores will be at the west end of the retort-house.

The gas as it is generated in the retorts passes up the ascension-pipes, which are fixed to the mouth of the retorts, into the hydraulic main. This is made of wrought iron in the shape of a ∪, and, being partially filled with water, seals the ends of the dip-pipes, thus securing the gas, after having left the retort, from again entering.

The gas leaving the hydraulic main enters into the foul main, which is formed of cast-iron pipes 20 inches inside diameter, fixed on cast-iron ornamental brackets outside the retort-house wall; then on to the condenser, which is of the annular type. This is the best condensing apparatus at present known for cooling the gas, and consists of two rows of wrought-iron pipes or tubes, eight in each row, 18 feet high, 32 inches diameter, having another tube inside, 22 inches diameter, and standing upon a neat blue brick and stone base or foundation, and surmounted by an ornamental cast-iron cornice. The condenser is so arranged that either row can be worked separately or combined, as required, and is further provided with trap-doors at top, one over each column, to admit or close out the atmosphere.

The gas having passed through the condenser, passes on to the exhauster, which is of the reciprocating type, and is capable of passing 120,000 cubic feet of gas per hour. It has two large exhausting cylinders, driven by a small steam-engine, fixed between them on the same bed-plate, and the stroke of the exhausting cylinders can be adjusted, by a screw arrangement fixed in the crank-plates, for summer or winter use; and the exhauster, by a very simple, self-acting arrangement, can be bye-passed, so that should the exhauster at any time want repairing, the flow of gas can pass on without any interference with the general working. The exhauster-house is 30 feet long, 25 feet wide, and 17 feet high to the springing of the roof, which is made of wrought-iron rafters and ornamental cast-iron struts, boarded diagonally with stained and varnished oak. The walls are neatly painted in plain colour. The floor is formed with ornamental cast-iron floor-plates. In the walls, just under the springing of the roof, there are four ventilators fixed; so should any escape of gas take place it will pass away into the atmosphere. On one side of the house there is a recess in the wall, which contains the pressure-gauges for all the other apparatus, so that any stoppage or irregularity occurring in them will easily be detected.

The gas leaving the exhauster is forced by that apparatus to and through the scrubber, which is 12 feet in diameter and 50 feet high, at which level there is fixed a machinery-room, 12 feet in diameter and 16 feet high, with a domed top and ornamental weather vane thereon. The admittance to the machinery-room is gained by passing up an ornamental cast-iron spiral staircase to a balcony round the scrubber, and constructed of ornamental cast iron. The scrubber is filled from bottom to top with layers of thin boards set on their edge, each layer laid at right angles to each other, and these boards presenting a very large surface are the best known principle for extracting the ammonia and other products from the gas, for which purpose the scrubber is erected. On the stone foundation or base of the scrubber there is erected a small ornamental wood engine-house, containing a small engine with pump, which answers two purposes—viz., pumping the water required in the scrubber from a cistern fixed near to, and also working the water-distributing apparatus in the interior of the scrubber. By an arrangement of pipes and valves the scrubber can be bye-passed should circumstances at any time require it.

The gas having passed through the scrubber, next passes on to the purifiers. These are four in number, each 24 feet square and 7 feet deep, and provided with seven tiers of wood grids in each purifier, upon which the lime is laid for taking out the remaining impurities from the gas. The purifiers are situated upon a floor laid upon cast-iron columns and girders, about 18 feet above the yard level of the works, and in the space underneath, the lime is prepared for use in the purifiers. When it is required therein, it is taken to the lime hoist, which is fixed in one corner of the house, consisting of a wrought-iron endless chain, on which buckets are secured. These fill themselves from a cistern or box, into which the lime is thrown, and then deliver it up on the purifier-floor above, discharging their contents close to where it is required. The purifiers are worked three on and one off, the one that is off being cleaned and charged with new lime; the centre-valve for changing them being what is known as the Thorncliffe dry-faced centre-valve. The covers of the purifiers are removed by a light wrought-iron travelling crane, which runs upon wrought-iron girders fixed on pilasters on each side of the purifier-house. The purifier-house is 110 feet long, 60 feet wide inside the walls, and 40 feet high to the springing of the roof, which is made entirely of wrought iron, and at the apex of the roof is a ventilator formed with louvre boards running the whole length of the building. The whole of the window openings are in the same manner filled in with louvre frames and boards, so as to obtain thorough ventilation, and to abate the danger of escaped gas accumulating. At the south-east corner of the purifier-house there is built a tower, which, near the top, contains a cistern 18 feet square and 8 feet deep, containing 16,000 gallons, to supply the whole of the works with water. This cistern is supplied with water from the well excavated underneath the centre of the tower, by a small steam-pump which has been fixed for that purpose. In the tower there are also two small store-rooms, for the receipt of the tools required by the workmen attending to the purifiers.

The gas having passed through the purifiers, passes on to the station-meter, which is capable of passing 80,000 cubic feet of gas per hour, and is ornamental in design, made of cast iron neatly picked out, and relieved with bronze and colour. At the back of the meter are the valves which allow the gas to go in and out of the meter, and also a bye-pass box, which enables the gas to pass on to the holder, should the meter at any time require repairing. The meter-house is 30 feet long and 27 feet wide, and 22 feet high to the springing of the roof, which is formed of wrought-iron rafters and ornamental cast-iron struts. The roof boarding is laid diagonally, stained oak and varnish. The walls are neatly painted in plain colour, and in the walls there are built four ventilators to allow any escape of gas to pass into the atmosphere.

The gas having been measured by the station-meter, passes on to the gasholder, which is constructed on the telescopic principle. It is 142 feet 6 inches in diameter, and 64 feet in height, and capable of containing over one million cubic feet of gas. The holder is surrounded by sixteen cast-iron columns, each 68 feet in height, with neat cap and base mouldings, and each column is secured to the tank-wall by four wrought-iron holding-down bolts, 20 feet long and 2 inches diameter. The columns are connected together at the top by sixteen wrought-iron trellis-work girders, joining over each column, the joint being covered by an ornamental cast-iron pediment or entablature, having in the centre the Stockport borough arms. The tank which contains the gasholder is 144 feet 6 inches in

* It may be mentioned that the price of gas per 1000 feet will next January be 3s. 1d. to small consumers, and 2s. 10d. to the largest consumers.—ED. J. G. L.

diameter, and 33 feet deep, and the dry well which contains the inlet and outlet pipes to the gasholder is 9 feet in diameter and 44 feet deep. Around the outside of the tank-wall is laid 2 feet of puddle, and all over the centre and under the walls is laid 15 inches of puddle, while in the centre of the tank there is a cone or mound left, which saves excavating and water, and also serves as a rest for the roof of the gasholder when down. The tank contains about 3 million gallons of water. About 20 feet in depth of the excavation was through solid red sandstone rock, which was found so hard as to have to be removed with dynamite. For the protection of the gasholder and tank from the floods of the River Goyt, a strong rubble stone retaining-wall has been built, 103 yards long, and 20 feet high.

The gas, on coming from the gasholder, enters into the governor, and this regulates the pressure at which the gas is to be delivered into the town. The governor is a small miniature gasholder, 5 feet diameter, and the pressure is regulated by raising or lowering the holder of the governor by means of a double-threaded screw and lever. The governor-house is 18 feet long, 16 feet wide, and 12 feet high to the springing of the roof, which is formed of wrought and cast iron, picked out neatly with colour. The roof boarding is laid diagonally, and the wall is painted plain colour. Should any escape of gas occur, there are four ventilators in the walls to allow it to pass away, also a recess for pressure-gauges, which contains two, one showing the pressure in the works, the other in the town.

The store-room, or office, is 30 feet long, 30 feet wide, and 16 feet high to the springing of the roof, which is formed of wrought and cast iron, picked out neatly with colour, the roof boarding being laid diagonally, stained oak and varnished, and the walls neatly painted plain colour.

The boiler-house is 36 feet long and 20 feet wide, and contains two two-flued boilers, each 24 feet long and 6 feet 6 inches diameter. A small square chimney has been erected, 18 yards high, for the boiler-flues and smithy fires.

The smithy and workshop is 30 feet long and 30 feet wide, and contains the hearths, anvils, and necessary benches and tools for the workmen.

The pump-house is 27 feet long and 22 feet wide, and contains two steam-pumps, one for tar and one for ammonia water, and also a small steam-ram pump for filling the boilers. The roof is formed by an ornamental cast-iron cistern for tar and ammonia water, supported on strong wrought-iron girders, and will contain about 35,000 gallons of tar and ammonia water, these being separated by a division-plate running the whole length of the cistern.

At the back of the pump-house, under the ground, is the well for the reception of the tar and liquor, 30 feet diameter and 22 feet deep, into which all the tar and ammonia water, as they are made, will run by gravitation. From this well they will be separately pumped out into the cistern over the pump-house by the steam-pumps before mentioned, and from thence delivered into the contractors barrels.

OPENING OF A NEW RESERVOIR AT THE WIDNES WATER-WORKS.

There has just been completed at Widnes what is believed to be the largest covered reservoir in the kingdom. It has occupied 2½ years in construction, and its completion forms the final step in the arrangements for the water supply of the locality.

Widnes is a manufacturing town in Lancashire, of about 22,000 inhabitants, and the water supply is under the control of the Local Board of Health. The town requires a large quantity of water for manufacturing as well as domestic purposes, the former demand being of peculiar importance. The supply is derived exclusively from wells, known as Stock's, Netherley, and Belle Vale Wells—the latter having only recently been purchased by the Local Board. The object of the new reservoir, which is situated at Rex Hill, is the storeage of the water pumped at Netherley and Stock's Wells. It is upon a lower level than the old reservoir adjoining it, the new one being intended to supply the town and the lower parts of the district, while the old one will be reserved for the higher portions. Separate leading mains have been laid with this object in view. The water can be delivered into the new reservoir direct from the engine-pumps, or through the overflow from the old one, as may be necessary. The length of the reservoir is 330 feet; it is 240 feet wide, and 22½ feet deep when overflowing. It will contain 10 million gallons when full, compared with 1¼ millions for the old one. The lower terrace and banks at the west end have been formed with the waste material from the excavation. The masonry of the piers and walls has been obtained from the site of the reservoir. The total cost, including the mains to and from the reservoir, amounts to over £30,000. The Contractor for the work was Mr. John Taylor, of Widnes; Mr. Henry Roberts being the Engineer.

On Thursday, the 17th ult., the public were admitted to an inspection of the interior of the reservoir, which was illuminated for the occasion. The ceremony of the opening was performed by Miss Gossage, daughter of Mr. F. H. Gossage, the Chairman of the Gas and Water Committee.

Major Cross, the Chairman of the Board, in some explanatory remarks, said that the ratepayers might be disposed to grumble at the size of the reservoir, which he believed was the largest covered one in the kingdom; but he thought it would not be found too large for the future wants of the inhabitants, seeing the importance of their manufacturing requirements. In case the pumps should, from any accident, break down the reservoir would contain a nine days supply of water for the town.

Mr. Carlile, in proposing a vote of thanks to Miss Gossage, said that the reservoir had cost £3 for every million gallons it would contain, the cost for such works throughout the country being, on the average, £5 per million gallons.

Mr. Gossage, in returning thanks on behalf of his daughter, briefly sketched the history of the water supply of Widnes during the past 20 years, and gave some statistics as to the sizes of other covered reservoirs in the district and elsewhere. Referring to the one just opened, he said it might be thought that the Local Board had provided too much accommodation; but it should be borne in mind that some of the large works in Widnes were dependent upon the Board for their water supply, several of the consumers paying them nearly £2000 per annum for it, and when they called to mind the fact that the population of Widnes in 1851 was only 3000, and that this year it was 22,000, and the rateable value £103,000, he could not think that the Board had done anything more than their bare duty in providing a perfectly reliable supply of that first essential to good health—good water.

A military band, which was in attendance, then played the National Anthem, and the proceedings in the reservoir terminated.

A dinner in celebration of the event was afterwards held in a marquee on the roof of the old reservoir.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

As I have noticed in previous reports, the electric light has, of late, commanded a great deal of attention in this district and experimental trials have been made in various ways, the most popular being football matches at night; but these have not, in every case, been attended with the success which the promoters of the new light could have desired. The question has also been under the serious consideration of the Manchester Corporation, who have extensive new gas-works in course of construction; but, so far, they apparently do not consider that their interests as gas manufacturers are very seriously threatened, although, as a matter of precaution, they are not, for the present, pushing forward fresh contracts for the new gas-works. This cautious policy is also exhibiting itself amongst gas manufacturers with regard to their contracts for gas coals, there being now very little desire to enter into more than the usual purchases over twelve months. Prices for gas coal are without quotable change, but there is very little doubt that large buyers could place their orders at very low figures, there being little or none of the usual winter drain upon this class of fuel for house-fire purposes, as heavy stocks of the better classes of round coal are held at many of the large collieries, and more of the pits are still running short time. The common descriptions of round coal for iron-making purposes are very bad to sell, and steam coal for shipping is offered at prices which leave less than 5s. per ton at the pit. Burgy and slack are also a drug, and forward contracts are being pushed for at very low figures. The quoted prices at the pit mouth are about as under:—Best house coal, 8s. 6d. to 9s. 6d; seconds, 6s. 6d. to 7s. 6d; gas coals, 6s. 6d. to 7s. 6d.; common coal, 5s. to 5s. 6d.; burgy, 4s. to 4s. 6d; and slack, 3s. to 3s. 6d. per ton. There is, however, a great deal of underselling going on in the market, and fixed prices are very exceptional.

The iron trade is in a very depressed condition. Lancashire makers of pig iron are endeavouring to meet the market, but the competition of outside brands is so keen that they find it very difficult to send any portion of the few orders offering in the market. Manufactured ironworkers are very short of orders, and good specifications could be placed at low figures.

Engineers and machine makers are discharging large numbers of hands, and a return to the hours of work that were formerly in vogue is under serious consideration.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The weather was extremely stormy in the North Sea last week. Steamers which were due in the Tyne, from London and the south, on Sunday and Monday, did not reach that port until Wednesday. Sailing ships coming down to load gas and other coals had been detained in the bays and roads eight or ten days, and had not reached the Tyne or Wear on Saturday. Under these circumstances, coasting freights advanced about 6d. per ton, and any active shipment of coals did not commence at the docks until Thursday.

A considerable amount of business was done in the way of shipments between that date and Saturday. Sailing ships have been needed for the north of France, London, and the British Channel, and to load gas coals for Dublin, Waterford, and other Irish ports.

West Pelton Colliery is likely to be closed, as the large firm of gas colliery owners to whom it belongs have a heavy output from their pits, and are limiting it somewhat. At several collieries in the county of Durham an attempt is being made to reduce wages. The Northumberland steam coal miners are under notice, which will expire on Saturday next, of a reduction of 12½ per cent. on their wages, and an extension of an hour per day in working the pits. The condition of the Northumberland miners continues to be extremely unsatisfactory. Most of the collieries are only half employed, and the earnings of the men in wages are small. It is certain that the Northumberland men will submit to a reduction of 12½ per cent. wages, but it is not equally clear that they will be disposed to agree to an extension of the day's work by an hour.

The general manufacturing trade of the North of England, like every other part of the country, has not been so generally dull and unproductive over a considerable number of years; business, however, is sound. There are no failures, at the same time all concerned in trade are restricting their operations as much as they conveniently can. The chemical business was extremely flat last week. There have been large importations of pig lead from Spain to the Tyne recently. There is not any great demand for lead, and prices are low. The season is about over for exporting fire-clay and fire-brick goods to the Baltic, and not much is going to other parts of the Continent. The price of fire-clay goods, like the price of every article of manufacture in the North, is low, and some factories which have not a position in the market, experience a difficulty in keeping their heads above water. The iron trade is without change.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The Aberdeen Corporation gas accounts were presented at a meeting of the Town Council held last Wednesday. They showed the total revenue for the past year was £47,269 13s. 5d., and the expenditure £38,837 2s. 4½d., leaving a balance of £8459 11s. 0½d. for net revenue account, to meet annuities and interest. On the part of the Gas Committee it was recommended that the price of gas for the ensuing year should be reduced from 4s. 5d. to 4s. 3d. per 1000 feet, and that the sum of £2000 should be set aside for the reduction of the debt on the purchase price of the undertaking. It was incidentally stated that since the purchase of the gas-works by the Corporation, in 1871, the price of gas had been reduced by 1s. 2d. per 1000 feet, and that, too, though coals were 20 per cent. dearer. In a statement of the probable revenue and expenditure in connection with the gas-works for the year 1878-79, it was estimated that there would be a surplus of £436 12s. 4d. One of the members of the Council suggested whether 1 per cent. was not too small an amount to set down for depreciation of buildings, and asked if it would not be a good thing to try the lighting of the piers and harbour with the electric light as an experiment. The Convener of the Committee defended the amount allowed for depreciation.

A further decided step has been made towards the acquisition of the local gas supply undertaking by the Elgin Town Council. At first that body offered the Gas Company what they considered a very handsome price—viz., £17 10s. per £10 share, but the offer was rejected, and the Company resolved that they would only deal by arbitration, as they did not wish to part with their property; neither would they name a price, for the same reason. Statutory notice was then given by the Town Council, and immediately afterwards the announcement of Edison's discovery was made. When the matter got wind, the Gas Company, according to the Provost of Elgin, changed to the right about in their ideas, and, instead of being unwilling to sell their property, they hurriedly appointed an arbiter, and served a notice on the Town Council requiring them to appoint on their part; failing doing so within 14 days they would hold them bound to abide by any award which their (the Gas Company's) arbiter might make. It was then the turn of the Town Council to ask for delay, and they requested that the time might be extended to one calendar month, in order that all parties might understand what was the result of the alleged discovery. The ground on which the indulgence was asked was that no man, however learned or however skilful as a practical Engineer, could in the uncertain state of their present knowledge give a fair and just opinion as to the value of the gas-works. The request was considered by the Gas Company at a meeting held last Tuesday, but it

was not acceded to; and the Town Council, at a special meeting since held, have also appointed an arbiter, as no other course was open to them. The two arbiters are—Mr. George R. Hislop, Engineer and Manager of the Corporation Gas-Works, Paisley, acting for the Gas Company; and Provost Robertson, of Dundee, who is well known as a highly skilled practical engineer, acting for the Town Council. Of course, they are empowered to appoint an oversman, whose decision, in the event of their not agreeing, shall be final and binding.

The annual meeting of the Kilbarchan Gas Company was held last Monday. From the abstract statement of affairs submitted by the Secretary, it was shown that the Company were in a prosperous condition.

At a meeting of the Edinburgh Town Council, held last Tuesday, two of the members gave notice of motion that it be remitted to the Lighting and Cleaning Committee to appoint a Committee of their number to acquire what information they possibly can regarding the adaptability of the electric light for illuminating the city, with power to send one or more of their members to see its effects where experiments are made with it, and to report to the Council.

The proposal on the part of some members of the Helensburgh Town Council to adopt the Burghs Gas Supply (Scotland) Act is at present becoming less popular, owing to the attention which is being given to the question of public lighting by magneto-electricity. A week or two ago there was some fear that opposition would be given to those members of the Town Council who, having pledged themselves in favour of the proposal, are offering themselves for re-election. It is urged that in the event of the electric light becoming available for general use, it would be well for gas companies to secure the right of supplying it.

The important village of Elderslie, lying between Paisley and Johnstone, and which, by the way, was the birth-place of the great Scottish patriot, Sir William Wallace, has never hitherto had its streets lighted up with gas. Now, however, the matter has been taken in hand by an energetic Committee, and a subscription has been raised to purchase the necessary lamps and maintain the lighting.

In Dalbeattie, Kirkcudbrightshire, owing to a dispute having arisen with the proprietors of the gas-works, the street-lamps throughout the town were lighted with oil during the past week.

On Saturday week, a Forfar Gas Corporation annuity, amounting to £1 10s., was sold for £35 15s.; and on Monday, Edinburgh gas shares and Glasgow gas annuities fell in price £2.

The application of the Paisley Corporation Gas Commissioners for a Provisional Order authorizing the raising of £30,000 for the extension of the gas-works has, after a public inquiry, been forwarded by Sheriff Cowan to the Home Secretary.

Some interesting information upon the water supply of Paisley was given by several of the Town Councillors of that thriving burgh, in the annual addresses which they recently delivered to their constituents. The Water Trust was shown to be in a very satisfactory condition, the total revenue for the past year having reached the sum of £13,008, and the surplus being £1769, with a domestic rate of 10d. per £1 of rental, and 1d. of public rate. In the year 1866, when the Rowbank scheme was proposed—the last important addition to the supply—the annual revenue was only £5568, and was derived from a domestic rate of 1s. 3d. per £1, and a public rate of 3d.—in all, 1s. 6d. That scheme was finished in 1869, and the supply was extended to the neighbouring town of Johnstone. The total rate fell to 1s. 3d.—1s. of a domestic rate, and 3d. of a public rate—and the revenue rose to £9750. The domestic rate for this year has been reduced to 8d. per £1 of rental, which is as low a rate as is charged in any town of considerable size in Scotland. Within the last ten years or so the manufacturing industries of Paisley have increased with enormous strides, a fact which is in a large measure due to the abundant and cheap supply of water; and arrangements are at present in progress for increasing the supply, by constructing a new reservoir capable of containing about 12 million cubic feet of water, or about 31 days supply for the whole town; the probable cost of the new works, including land, being estimated at about £13,000. These facts certainly possess a good deal of interest, when it is borne in mind that about ten years ago the town of Paisley was in a state of bankruptcy.

At last week's meeting of the Annan Police Commissioners a report was presented by the Water Committee, recommending the adoption of a comprehensive scheme, which had been devised by Messrs. J. and A. Leslie, Civil Engineers, Edinburgh, for supplying the town with water from the river Annan. The cost of the scheme, exclusive of the price of the land to be procured, is estimated at £5775, and it is proposed to pump water from the river at Newbie Millholm to the high ground at Watchill, above the town, whence it can be transmitted by pipes into the town. The report was adopted.

A very decided feeling is arising in Kilmarnock in favour of the water supply being in the hands of the Town Council instead of a private Company, and a suggestion has been thrown out that a Bill should be presented to Parliament to empower municipal bodies to acquire water supply undertakings on somewhat similar lines to those embodied in Sir Windham Anstruther's Gas Act. One member of the Kilmarnock Town Council has lately remarked that it would have been better for the entire community if the Council at the time had taken over the water instead of the gas. At present the manufacturers of the town feel that they have a serious grievance with the Water Company on account of the niggardly way in which they are treated by that body, as compared with the treatment which the manufacturers in Paisley and Greenock receive from the Water Trust in those two towns.

A meeting of the Irvine Water Commissioners was held last Wednesday, Provost Paterson presiding. A report was read from Messrs. J. and A. Leslie, C.E., Edinburgh, on the condition of the water-works. It stated that the stream of water which came from underneath the reservoir sprung from the ironstone rocks met with in excavating a puddle trench, and that there was no danger of it impairing the embankment. They did not recommend the drawing of the reservoir for the purpose of cleaning out the bottom, as they were of opinion that the leakage at the filters would soon take up, as had occurred in similar works. It was agreed to delay the question as to whether the reservoir should be cleaned out, and the water run off. A report was read from the Committee recommending that a rate of 2s. per £1 be levied in terms of the Public Health Act, half on owners and a half on tenants, to defray the expenses of the introduction of the gravitation scheme. This was agreed to.

The Glasgow pig iron warrant market was tolerably steady last week, and a considerable amount of business was done daily. Business was transacted on Friday afternoon at 44s., cash in ten days; at 43s. 10½d. prompt cash; and at 44s. 1d. one month.

In the coal market there is still much quietness. Shippers do not seem to be inclined to purchase large quantities at present. A slight stimulus has been given to the home coal trade by the cold weather which has suddenly set in.

THE SEWAGE OF WIGAN.—The Wigan Town Council have adopted a scheme, prepared by Mr. Brundell, C.E., for the disposal of the sewage of the town by irrigation. At present it is turned into the River Douglas, and the Local Government Board have granted a further order, protecting the town for three months, from the 17th ult., from the provisions of the Rivers Pollution Act, 1876. To carry out the scheme, arrangements have just been concluded with the Earl of Derby for a sewage farm at Newburgh, seven miles distant from the present outfall. The total cost of carrying out the scheme is set down at £62,544. At a meeting of the Town Council on Monday the 21st ult., it was resolved to forward the plans and estimates to the Local Government Board for their approval.

BRADFORD CORPORATION GAS SUPPLY.—At the meeting of the Bradford Town Council last Tuesday, the annual report of the Gas Committee was submitted, from which it appears that the gas stations are in good order. 11,121 yards of gas-mains and 6828 yards of service-pipes have been laid in the year. Tenders have been accepted for the erection of new gas-works at Birkshall, Bowling, which are in progress. The gas-mains to these works are being laid. Brick-making machinery has been put up at Birkshall, there being an excellent bed of clay on the site. The ammoniacal liquor and tar produced at the gas-works have been sold for seven years, at 2s. 5½d. per ton of coal carbonized. The previous contractor paid only £850 per annum for all the liquor produced, but that contract was made by the old Company, when the liquor was almost valueless. Messrs. Stainsby and Lyon have purchased the tar for three years, at £1 16s. per ton. Pipes are being laid from Mill Street and Valley Road to the canal, to convey the tar to the boats. The price of gas had been reduced from 3s. 4d. to 3s. per 1000 cubic feet, and a new scale of discounts allowed. Contracts have been entered into for the supply of coal and cannel for the year.

INTERNATIONAL ASSOCIATION FOR THE SUPPLY OF POTABLE WATER.—This Association, which was formed in Paris during the sittings of the Hygienic Congress, is actively engaged in the prosecution of its labours. At the 67th general meeting of the Netherlands Industrial Association, recently held at the Hague, considerable interest was manifested in the subject of a pure water supply, and the desirability of placing it under Government supervision. A petition embodying the views of the Association, and containing four questions having special reference to water supply, was drawn up and afterwards presented to the Minister for Home Affairs, urging him to request an early reply thereto from the several communes. The questions were as follows:—1. What kind of water is generally used in your commune? 2. In what manner is such water collected? 3. Is the water collected and stored in cisterns, and, if so, on what principle are such cisterns constructed and kept in repair? 4. Is the water obtained from springs, wells, or pumps, from marshy lands or rivers, and how is its quality affected by the proximity of factories and other similar establishments, or by cemeteries? The formation of the International Association, and the action taken by the Netherlands Industrial Association, having engaged the attention of Prince Bismarck, he at once communicated with Mr. J. G. Jäger, Director of the Amsterdam Water-Works, the leader of the movement in Holland, apprising him of the great interest he had taken in the proceedings, and stating that all documents relating to the subject of water supply had been forwarded to the Board of Health for the German Empire, the President of which has since put himself in communication with Mr. Jäger. The Earl of Beaconsfield has also addressed a letter to this gentleman expressing approval of his proceedings in a matter to which so much attention is directed in England.

DONCASTER CORPORATION WATER-WORKS.—At a meeting of the Doncaster Town Council, on Wednesday, the 23rd, the Mayor, in explanation of certain resolutions passed by the Urban Sanitary Authority in committee, stated that it would be necessary for the Corporation to go to Parliament next session for an amendment of their Water-Works Act, with a view to extending their borrowing powers from £85,000 to such sum as might be required to complete the works; but a special meeting of the Council would be called for the consideration of the project, when certain clauses prepared by the Town Clerk would be submitted. Mr. Brundell, C.E., the Engineer of the works, being present, was requested to make a statement as to the position of the works, more especially with reference to certain leakages in the reservoirs. In reply, he said that nothing had occurred, since the official inspection of the works, to alter his opinion as to the desirability of completing them as they stood. They had taken certain measures for stopping the leakages, but until the water had again accumulated in the reservoirs it would be impossible to say whether they had been effectual or not. In a few months time those measures would have been fully tested, and he should be then in a position to say how far they had been successful. He further mentioned that three wells made in the main embankment, to deal with certain springs which had been met with, had been opened; but there was no escape from these, and two of the wells had been filled up at his recommendation. He also promised to make a monthly report as to the progress of the works, which, save for the leakages, would now have been approaching completion.

THE WATER QUESTION AT GOOLE.—The announcement recently made by the Goole Local Board, that they were about to construct water-works for the town, has caused considerable excitement in the locality. On Friday evening, the 18th ult., while the members of the Local Board were sitting in committee for further considering the matter, some of the ratepayers assembled before the offices, and appointed a deputation to wait upon the Board, and request them to receive the ratepayers in a body. This the Board declined to do, but intimated that they would attend a meeting of the ratepayers, on receiving 48 hours notice. Consequently, on the following Monday evening one of the largest meetings of ratepayers ever held in Goole took place, the object being to hear the views of the members of the Local Board on the water question, it being considered in some quarters that, heavily burdened as the town was with rates, it was much better that the Company who were in course of formation when the Board interfered, should be allowed to go on with their work. The chair was occupied by Mr. John E. Porter, and the Board were represented by the Rev. Dr. Bell (Chairman), and Messrs. Boyd, Morfitt, and Gleadow. The Rev. Dr. Bell stated that his policy had been in every possible way to prevent the rates of the district being increased. He still held to that view, and contended that in his present action in regard to the water-works he was still adhering to them. The reason why he had altered his opinion was in consequence of what transpired when the Inspector of the Local Government Board visited the town. He strongly urged the Board to have the water-works in their own hands, and not to let them fall into those of a private company. The Board needed water to flush the sewers; and, again, it was well known that the property owners had failed in their duty in providing water for their houses. Mr. Gleadow and Mr. Morfitt followed, and explained their views amid frequent interruptions. They were in favour of the Board having the works in their own hands. Mr. Boyd contended that the management of the water-works by the Company would be more economical than by the Board. Considerable discussion followed, questions being asked and speeches made, and, eventually, the following resolution was carried by a very large majority:—"That, in the opinion of this meeting, it is inexpedient that water-works should be erected by the Local Board with the public money, and it is desirable that the water-works scheme, with its risks of loss or profit, should be left to a private company."

APPLICATIONS FOR LETTERS PATENT.

4278.—Welch, E. J. C., Manchester, "Improvements in apparatus for dividing and distributing, or for collecting, electric currents for lighting and other purposes." (Complete specification.) Oct. 25, 1878.

4283.—Stokes, J. E., Upton Manor, Essex, "Improvements in obtaining light by electricity, and an apparatus for its application to illuminating purposes." Oct. 25, 1878.

4288.—Snuggs, E. A., Windsor, Surrey, "Improvements in water-taps, which taps are also applicable to other purposes." Oct. 25, 1878.

4290.—Gale, G., New Wortley, Yorks, "Improvements in the means or apparatus for igniting, regulating, and extinguishing the lights in street and other lamps." Oct. 25, 1878.

4304.—Shea, C. E., Foot's Cray, Kent, "A method of dividing and distributing the current produced by magnetic batteries and magneto and dynamo electric machines into an indefinite number of separate currents, equal, or relatively unequal, to each other in quantity or force." Oct. 26, 1878.

4309.—Brunton, J., Westminster, "Improvements in sluice-valves or sluice apparatus." A communication. Oct. 26, 1878.

4312.—Johnson, S., Wood Green, London, "Improvements in apparatus for preventing waste of water in water-closets, urinals, lavatories, and other situations where intermittent supplies of water are required." Oct. 26, 1878.

4313.—Cochrane, A. A., Westminster, "Improvements in obtaining electricity, and in the application thereof to the electric light, and to other useful purposes." Oct. 26, 1878.

4315.—Stockman, B. P., Westminster, "Improvements in apparatus for producing light by electricity." Oct. 26, 1878.

4317.—Tilleard, F. D., Kensington, London, "Improvements in lamps for lighting by electricity." Oct. 26, 1878.

4333.—Orme, D., Oldham, Lancs, "Improvements in wet gas-meters." Oct. 28, 1878.

4338.—Harrison, C. W., South Kensington, London, "Improvements in obtaining light by electricity, and in the means or apparatus employed therein." Oct. 28, 1878.

4347.—Wilson, J. S., West Sunderland, Durham, "Improvements in and appertaining to apparatus for producing electric light." Oct. 29, 1878.

4349.—Fosbery, G. V., Cannon Street, London, "Improvements in and relating to pumps." Oct. 29, 1878.

4352.—Cutler, S., Millwall, London, "Improvements in gas-valves, and in the arrangement of the pipes connecting them with the vessels with which they may be employed." Oct. 29, 1878.

4353.—Imray, J., Southampton Buildings, London, "Improvements in the treatment of ammoniacal liquor for the separation of ammonia compounds therefrom." A communication. Oct. 29, 1878.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

1754.—Michel, C., and Frager, A., Paris, "Improvements in water-meters." May 1, 1878.

1764.—Cutler, S., Millwall, London, "Improvements in apparatus used in the manufacture of gas." May 2, 1878.

1798.—Hallewell, R., Blackburn, Lancs, "Improvements in gas-engines, applicable in part to other uses." May 4, 1878.

3257.—Hills, F. C., Deptford, Kent, "Improvements in the manufacture of sulphate of ammonia, and apparatus to be used in the said manufacture." Aug. 17, 1878.

3274.—Sutherland, W. S., Birmingham, "Improvements in and apparatus for purifying and burning gases, and in apparatus for generating combustible gases." Aug. 20, 1878.

Share List of Gas and Water Companies.

(Corrected by Mr. F. N. Golding, Sun Court, Cornhill, from the latest Stock Exchange Quotations.)

Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann.	Latest Quotations.	Number of Shares issued.	Amount per Share.	Name.	Amount paid up per Share.	Last Divd. p.Cent. p. Ann	Latest Quotations.
	£	Gas Companies.	£ s. d	£ s. d	£		£	Gas Companies.	£ s. d	£ s. d	£		£	Gas Companies.	£ s. d	£ s. d	£
589892	10	Alliance and Dublin	10 0 0	10 0 0	13¼—14½	6300	5	Georgetown,Guiana	5 0 0	5 0 0	..	12500	5	Singapore(Limited)	5 0 0	7 10 0	5¾—6¾
10000	20	Anglo-Romano . .	20 0 0	10 0 0	20—24	300000	100	Glasgow Corporation Gas	100 0 0	9 0 0	205—215	2000	5	Do., preference .	5 0 0	7 10 0	5¾—6¾
5000	20	Bahia (Limited). .	20 0 0	3 0 0	10—12							4000	50	South Metropolitan	50 0 0	11 0 0	87—90
1000	20	Do., do., redeem.	20 0 0	10 0 0	25—27	115000	100	Do., do.	100 0 0	6 15 0	150—160	4000	12½	Do.	12 10 0	11 0 0	21—23
1500	20	Do., 2nd pref. . .	20 0 0	7 10 0	..	..	100	Grimsby Gas, A . .	100 0 0	..	185—190	20000	12½	Do., new shares .	12 10 0	11 0 0	20½—21½
40000	5	Bombay (Limited).	5 0 0	7 10 0	4—5	..	10	Hampton Court . .	10 0 0	10 0 0	15—16						pm.
10000	5	Do., fourth issue.	4 0 0	7 0 0	3—4	7000	10	Hong Kong (Lim.)	10 0 0	10 0 0	16—18	15000	10	Surrey Consumers.	10 0 0	10 0 0	14—15
5000	20	Bournemouth . . .	10 0 0	7 0 0	..	5000	10	Hornsey	10 0 0	10 0 0	..	10000	10	Do., new	8 0 0	10 0 0	3–4 pm.
229700	..	Brentford	100 0 0	9 0 0	130—140	2000000	50	Imperl. Continental	100 0 0	5l.p.sh.	140—150	..	5	Tottenham and Edmonton	5 0 0	10 0 0	10¼—11
..	..	Do., 5 per ct. pref.	100 0 0	5 0 0	90—93	..	..	Kingston	..	..	..						
..	20	Do., C shares . .	10 0 0	9 0 0	3—4 pm.	..	..	Lea Bridge	..	..	..	1500	10	Wandsw. & Putney	10 0 0	10 0 0	15—16
5400	20	Brighton	20 0 0	10 0 0	27—29	9000	4	Limerick Gas . . .	4 0 0	2 10 0	2—2½	1500	10	Do.	10 0 0	7 10 0	11—12
5000	20	Brighton and Hove	20 0 0	10 0 0	27—29	56100*l.*	100	Liverpool United .	100 0 0	10 0 0	143—145	4000	10	Do.	10 0 0	7 0 0	..
13000	20	British (Limited) .	20 0 0	10 0 0	39—31	1691000*l.*	100	Do., B	100 0 0	7 0 0	112—114	..	..	West Kent	..	..	..
7223	20	Cagliari (Limited).	20 0 0	6 0 0	16—18	3849000*l.*	Sk.	London	100 0 0	10 0 0	140—150	..	..	Woolwich, Plmstd., and Charlton . .	..	..	..
1500	10	Colney Hatch . . .	10 0 0	5 0 0	9—10	1622500*l.*	Sk.	Do., 1st pref. . .	100 0 0	6 0 0	105—115						
5500000*l.*	Sk.	Commercial	100 0 0	10 0 0	140—150	14450	Sk.	Do., 2nd pref. . .	100 0 0	6 0 0	100—106	26000	5	West Ham	5 0 0	10 0 0	6—8
70000	100	Do., 7 per cent. .	100 0 0	7 0 0	110—120	4350	Sk.	Do., 3rd pref. . .	100 0 0	6 0 0	95—100						
20000	20	Continental Union.	20 0 0	6 0 0	15—16	7622	25	Do., A shares . .	..	6 0 0	24—26						
2000	20	Do., new	12 10 0	6 0 0	5–3 dis.	266921.	All	Do., Debent. stk.	100 0 0	5l.& 6l.	..						
10000	20	Do., preference .	20 0 0	7 0 0	20—21	15000	5	Malta and Mediterranean (Limited).	5 0 0	2 10 0	1¾—2¼	615600	100	Water Companies. Chelsea	100 0 0	6 0 0	153—157
75000	Sk.	Crystal Palace Dist.	100 0 0	10 0 0	140—150												
125000	Sk.	Do., 7 per cent. .	100 0 0	7 0 0	115—125	6000	5	Do., preference .	5 0 0	7 10 0	5 —6	1624700	100	East London . . .	100 0 0	6 0 0	150—154
50000	Sk.	Do., preference .	100 0 0	6 0 0	105—115	20000	5	Mauritius (Limited)	2 5 0	2 10 0	1¾–1¼ dis	10798	50	Grand Junction . .	50 0 0	5 0 0	83—87
7100	25	Edinburgh	25 0 0	10 0 0	43—47	25000	20	Monte Video (Lim.)	20 0 0	8 0 0	11—13	5840	25	Do., ½ shares . .	25 0 0	5 0 0	41½—42½
23405	10	European(Limited)	10 0 0	10 0 0	13—15	8000	10	Nictheroy,Braz.(L.)	10 0 0	5 0 0	..	6160	25	Do., new ditto; max. div.,7½ p.c.	25 0 0	5 0 0	37—39
12000	10	Do., new shares.	7 10 0	10 0 0	2—3 pm.	30000	5	Oriental (Calcutta).	5 0 0	9 10 0	5—6						
35406	10	Do., new shares .	5 0 0	10 0 0	1—3 pm.	30000	5	Do., new shares .	3 0 0	9 10 0	par-½pm	5551801.	100	Kent	100 0 0	8 0 0	210—215
4094840*l.*	Sk.	Gaslight & Coke A.	100 0 0	10 0 0	142—146	10000	5	Ottoman (Limited).	5 0 0	3 0 0	2—2½	781800*l.*	100	Lambeth	100 0 0	6 5 0	152—156
1000000*l.*	Sk.	Do. B.	100 0 0	4 0 0	70—75	10000	10	Pará (Limited) . .	10 0 0	3 0 0	4—5	326150*l.*	100	Do., max.,7½ p.c.	100 0 0	6 5 0	147—151
50000	10	Do. 5 per ct. pref. conv.,4th issue.	10 0 0	5 0 0	12—13	27000	20	Phœnix	20 0 0	10 0 0	28—30	442	100	New River	100 0 0	7 0 0	320—350
						3600000*l.*	100	Do., new max. 7½	80 0 0	7 10 0	90—100	4475	100	Do.	85 0 0	7 0 0	280—300
50000	10	Do. do., 5th do. .	6 0 0	5 0 0	2-2½ pm.	1440000*l.*	Sk.	Do., capitalized .	100 0 0	5 0 0	80—90	400000	100	Do.,deb.sk.,4 p.c.	100 0 0	4 0 0	101—103
2000000*l.*	Sk.	Do. C 10 p.c. pref.	100 0 0	10 0 0	180—190		20	Do., new, 1876. .	6 0 0	10 0 0	6—8 pm.	666800*l.*	100	Southwrk. & Vauxh.	100 0 0	2 0 0	106—110
3000000*l.*	,,	Do. D do. do. .	100 0 0	10 0 0	180—190	..	..	Richmond (Surrey)	..	..	..	324700*l.*	100	Do., pref. stock .	100 0 0	5 0 0	111—115
1650000*l.*	,,	Do. E do. do. .	100 0 0	10 0 0	180—190	37500	20	Rio de Janeiro (L.)	20 0 0	10 0 0	17—19	1265001.	100	Do., D shares . .	100 0 0	4 0 0	104—106
300001.	,,	Do. F 5 do. do. .	100 0 0	5 0 0	90—95	1500	32½	Shanghai	32 10 0	12 0 0	30—32	700001.	100	Do., new ordinary	..	4 10 0	..
600001.	,,	Do. G 7½ do. do. .	100 0 0	7 10 0	135—145	..	100	Sheffield, A	100 0 0	10 0 0	175—185	1600	100	Do., new ord. No.1	40 0 0	4 10 0	..
1300000*l.*	,,	Do. H	100 0 0	7 0 0	107—112	..	100	Do., C	100 0 0	10 0 0	175—180	15073	61	West Middlesex . .	61 0 0	6l.p.sh.	138—142

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION, TWO MEDALS at the PHILADELPHIA EXHIBITION, and TWO MEDALS at the PARIS EXHIBITION, have been AWARDED to GWYNNE & CO. for GAS-EXHAUSTERS, ENGINES, and PUMPS; Also 27 OTHER MEDALS AWARDED at all the GREAT INTERNATIONAL EXHIBITIONS.

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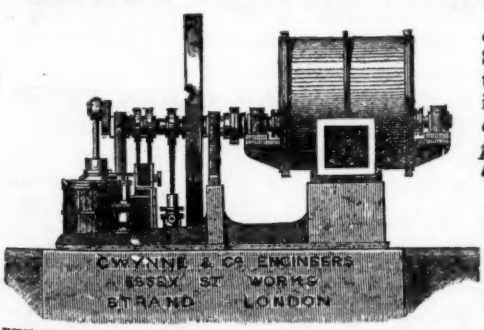

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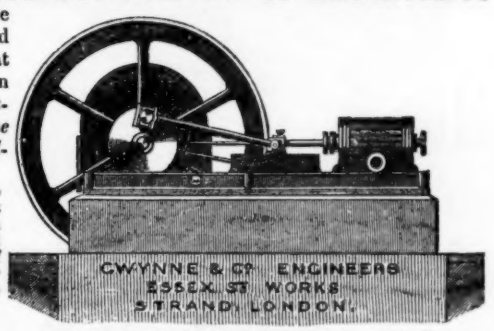

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WANTED, by Samuel Thompson & Co., Colliery Office, Lancaster, APPLICATION for PRICES from Gas Managers who are prepared to receive Tenders for GAS COAL or CANNEL.
John Leigh, Esq., M.R.C.S., F.C.S., &c., &c., in his analytical report of S. T. & Co.'s Coal, says: "It is remarkable for its purity, I have scarcely ever examined a Coal containing so small a quantity of ash, and when Cannel of the best description is scarce, it may well replace this material."

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GEORGE WALLER AND CO., having issued a NEW ILLUSTRATED CATALOGUE, will be glad if any Gas Manager, who has not received a Copy, will advise them to that effect.
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TWO Purifiers, 8 ft. square, with 8-in. Valves and Connections. All complete, and equal to new.
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AN increased yield of gas, and of augmented illuminating power, is obtained by employing WHITE'S AUTOMATIC VALVE, and dispensing with the Hydraulic Main, the tar of which, as is well known, absorbs the rich constituents of the gas, consequently, diminishes alike the quantity and quality.
Further particulars, &c., upon application to WILLIAM WHITE, Gas-Works, Abersychan, MON.
A Pamphlet descriptive of the above method, post free, 6½d.

STATION-METER FOR SALE.

THE Gas Committee of the Rochdale Corporation offer for SALE a STATION-METER, capacity 25,000 cubic feet per hour, 12-in. Connections, Hydraulic Valves, and Bye-Pass, and all other necessary fittings. The Meter to be removed in consequence of extensions.
Any further information thereon can be had from the Manager at the Works.
Tenders, endorsed "Tender for Station-Meter," must be sent to me on or before the 13th inst.
By order,
ZACH. MELLOR, Town Clerk.
Town Hall, Rochdale, Aug. 2, 1878.

TO GAS-METER MAKERS.

THE Southport Corporation invite TENDERS for the Supply of DRY GAS-METERS in Tin Cases and WET GAS-METERS in Cast-Iron Cases, from 2 lights to 200 lights in size; stamped by Government, at a price per Meter and for a term of One, Two, or Three years.
Further particulars will be supplied on application to Mr. Robert Iddon, the Manager of the Gas-Works.
Sealed tenders, marked "Meters," to be sent to me not later than Wednesday, Nov. 27, 1878.
By order,
KEIGHLEY WALTON, Town Clerk.

TO TAR CONTRACTORS.

THE Directors of the Kingston-upon-Thames Gas Company are prepared to receive TENDERS for the Purchase of the Surplus TAR produced at their Works from Nov. 13, 1878, to June 30, 1879.
Particulars as to quantity, &c., may be obtained on application to Mr. Packham, Engineer, at the Works, Lower Ham Road.
Tenders to be sent in, addressed to the Chairman, not later than Tuesday, the 12th day of November, endorsed "Tender for Tar."
The Directors may require the Contractor to find security for the faithful fulfilment of his contract.
The Directors do not bind themselves to accept the highest or any tender.
W. A. FRICKER, Secretary.

TO CHEMICAL MANUFACTURERS, TAR DISTILLERS, AND OTHERS.

TENDERS FOR TAR AND LIQUOR.

THE Directors of the Shipley Gaslight Company are prepared to receive TENDERS for the Purchase of their Surplus TAR and AMMONIACAL LIQUOR for One, Two, or Three years, from Jan. 1, 1879. The Company will load f.o.b. the Leeds and Liverpool Canal at Shipley, or into the Contractor's carts on the Works. The quantity of coal carbonized in twelve months is 8000 tons.
Any further particulars may be obtained on application to the Secretary.
Sealed tenders to be sent in (stating separately price per ton for Tar and Liquor, endorsed "Tender for Tar, &c.") on or before Nov. 13, 1878.
JNO. WILCOCK, Secretary.
Gas-Works, Shipley, Oct. 29, 1878.

BURSLEM CORPORATION GAS-WORKS.

SALE OF AMMONIACAL LIQUOR.

THE Gas Committee invite Tenders for the Purchase of their entire supply of AMMONIA WATER.
For further information apply to Mr. H. Peaty, Manager, Longport, Stoke-on-Trent.
Tenders, sealed and endorsed, to be sent to me not later than Monday, Nov. 11, 1878.
The Committee do not bind themselves to accept the highest or any tender.
J. W. POWELL, Town Clerk.
Town Hall, Burslem, Oct. 29, 1878.

IMPERIAL CONTINENTAL GAS ASSOCIATION.
(INCORPORATED BY ACT OF PARLIAMENT.)
NOTICE is hereby given that the HALF-YEARLY ORDINARY MEETING of the PROPRIETORS of the Imperial Continental Gas Association will be held at the City Terminus Hotel, Cannon Street, London, on TUESDAY, the 26th inst., at Two o'clock in the afternoon precisely, when a report will be made to the Proprietors, a Dividend declared for the half year ended June 30, 1878, and the usual ordinary business of such meeting transacted.
Notice is also hereby given that the Transfer Books will be closed on Tuesday, the 12th inst., and will remain closed until after the Half-Yearly Ordinary Meeting on the 26th inst.
ALBERT F. JACKSON, Secretary.
By order of the Board.
30, Clement's Lane, Lombard Street,
London, E.C., Nov. 4, 1878.

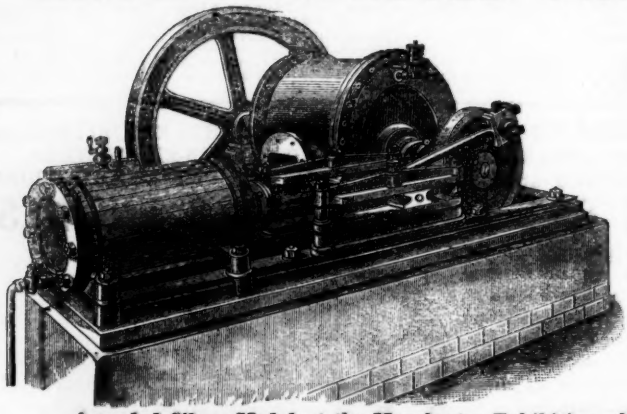
TO GAS-METER MAKERS.

THE St. Helen's Corporation invite TENDERS for the Supply of 174 WET GAS-METERS—viz.: 18, 10-light; 36, 5-light; 60, 3-light; and 60, 2-light. The whole to have Cast-Iron Cases, Tin Index Boxes, and Block-Tin Drums. To have one coat of green varnish paint, and to be tested and stamped as provided by the Sales of Gas Act.
Tenders to state the price each for the several sizes of meters, delivered to these Works in quantities as required to Sept. 30, 1879.
Sealed tenders, endorsed "Tender for Meters," and addressed to the Chairman of the Gas Committee, to be sent to the undersigned not later than Tuesday, the 12th inst.
By order,
EDWARD DYSON, Secretary.
Gas Office, Warrington Old Road,
St. Helen's, Nov. 4, 1878.

BEALE'S IMPROVED PATENT GAS EXHAUSTERS

WITH

Wrought-Iron Spindles and ENGINES COMBINED.



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LIVESEY'S PATENT WASHER.

This apparatus effects the most intimate contact between the liquor with which it is supplied and the gas passing through it, resulting in the complete removal of all particles of tar, increasing the ammonia strength of the scrubber and condenser liquor, and removing a large proportion of other impurities—notably, carbonic acid. The Washer is intended to work in conjunction with a scrubber. It occupies little space, and is inexpensive. It has been in successful constant use for nearly three years, does not become clogged with tar or corroded by the action of the liquor or gases, it gives three inches of pressure, and only needs a supply of liquor to keep it in regular action without any further attention.

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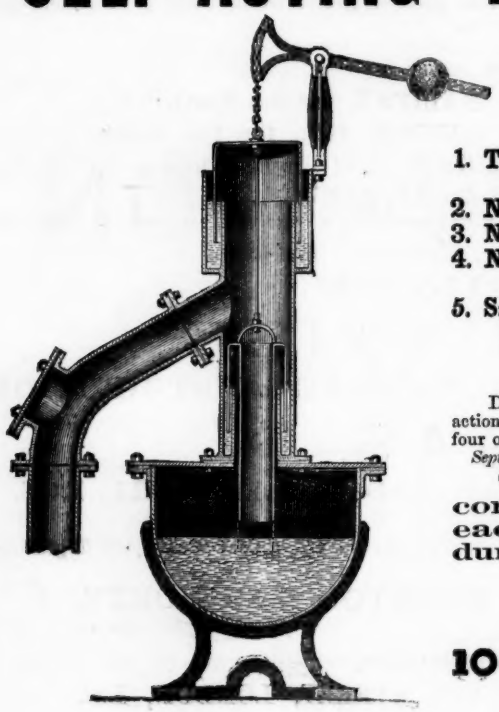

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FOR GAS, STEAM, AND WATER.

Hot Water Tubes, Core Bars, Lap-welded Iron Boiler Tubes.

CAST-IRON PIPES for GAS & WATER.

Brass and Gun-Metal Fittings, Valves, Cutting and Screwing Tools, &c.

NOTICE TO MANAGERS OF GAS COMPANIES.

THE LAW UNION FIRE AND LIFE INSURANCE COMPANY, of No. 126, Chancery Lane, London, grants Policies of Insurance on Gas-Works, and Buildings connected therewith, which cover risk of explosion and spontaneous ignition of Coal, on very advantageous terms. Full particulars will be sent post free on application to

FRANK M'GEDY, Secretary.

126, Chancery Lane, London.

MR. EDWARD SANDELL,

Associate of the Society of Accountants in England,
Publisher of the
"Gas Companies Expenditure Journal,"

Begs to announce his REMOVAL from Skinner's Place, Size Lane, to

No. 2, ST. GEORGE STREET, WESTMINSTER.

W. LIDDALL,

Public Accountant,

15, UNION COURT,

OLD BROAD STREET, E.C.

Mr. ROBERT DEMPSTER, Sen.,

CONSULTING GAS ENGINEER,

Of Messrs. Robert Dempster and Sons, Rose Mount Gas Engineering Works,

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May be consulted on all matters connected with Valuations, Arbitrations, and Parliamentary Applications connected with Gas-Works. Our R. D., Sen., having been engaged on extensive Arbitration Cases, which, combined with his experience in Construction and Contracting, his knowledge of Engineering and Valuations, is both extensive and reliable.

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BY

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COOKE BROTHERS

Beg to draw the attention of Gas Companies to the following certificate, relative to the quantity and quality of their Oxide, from the Assistant Surveyor of the County of Donegal:—

"*Londonderry, Oct.* 12, 1878.

"I have examined some of the deposits of iron ore in the following localities in the county of Donegal, over which Messrs. Cooke Brothers hold exclusive royalties for raising the ore—namely, several townlands in the Barony of Kilmacrenan, including the estate of Viscount Southwell, in the Barony of Raphoe, the estates of Sir Samuel Hayes and Colonel Montgomery, in the Barony of Ennishowen, several townlands on the estate of Mr. Newton—and I certify that the several estates are rich in Oxide; that the ore is of a very good quality, such as is usually shipped from this county; that the districts, which are very extensive, are capable of producing a large supply; in fact, the supply of ore on these estates is practically inexhaustible.

(Signed) "PHILIP M'LAUCHLIN, *Assistant County Surveyor.*"

COOKE BROTHERS beg to state they are also in possession of several other exclusive sources of supply, independent of those included in the above certificate.

26, 27, *and* 28, *Fenchurch Street, London, E.C., Oct.*, 1878.

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SPECIAL ACCOUNTANT FOR GAS COMPANIES,
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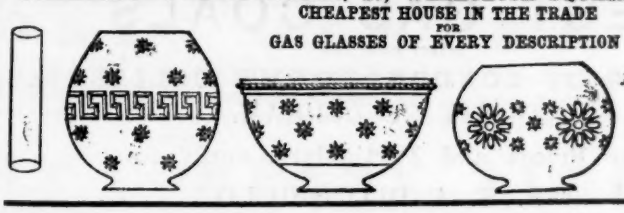

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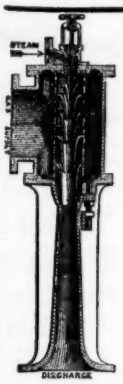

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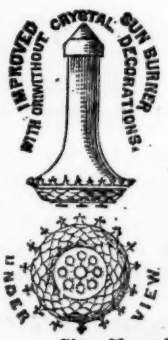

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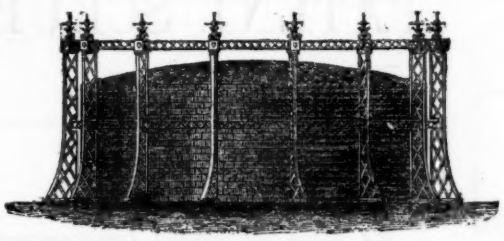

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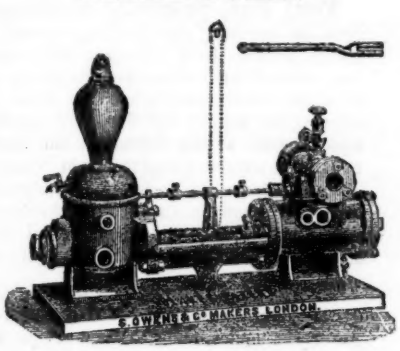

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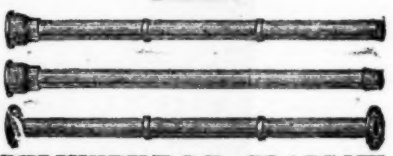

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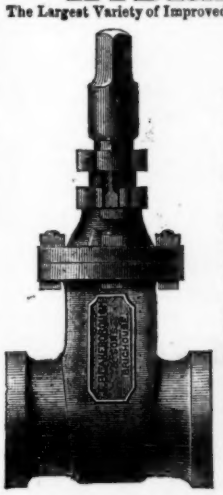

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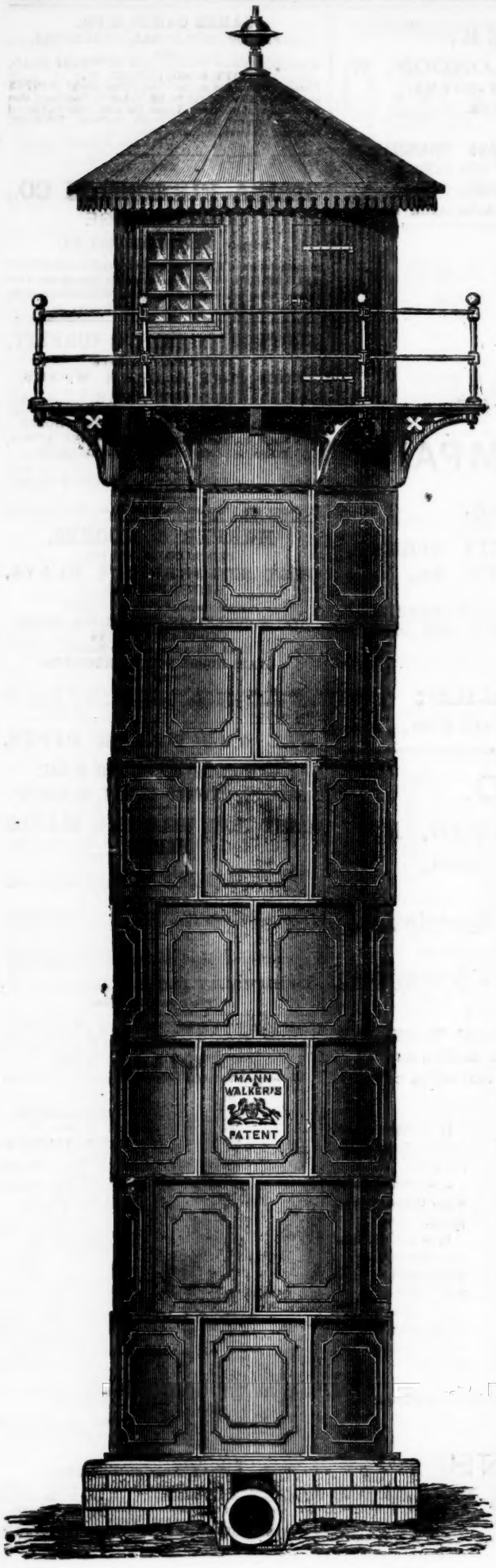

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MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

By some important improvements recently patented, the purifying power of these Scrubbers has been much increased, and a stronger ammoniacal solution obtained, which is found to absorb a large portion of the carbonic acid contained in gas, effecting an important saving in money and labour in the lime purifiers, and where oxide only is used, the increase in the illuminating power of the gas obtained by these Scrubbers is shown in a remarkable degree, in consequence of the large quantity of carbonic acid removed from the gas.

It is to be particularly noted that the im-portant results of these Scrubbers do not depend upon the machinery alone. The entire internal construction of the Scrubber bears an almost equally important part. For this reason, where it is desirable to convert existing Scrubbers, whose dimensions happen to be suitable, the work commences by ripping out the whole of the interior of the shell, and beginning the internal construction *de novo* from bottom to top.

Fifty million cubic feet of gas per 24 hours are purified from ammonia by these Patent Scrubbers in a winter's day in the gas-works of London, where the purity of gas supply is the highest in the world, under the chemical restrictions of the Board of Trade.

Generally, wherever a high standard of purification is maintained in the chief cities and towns of the British Provinces and of Europe, these Scrubbers have become established.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals, generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

They contain their own engine power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

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ONE GOLD MEDAL, in Class 27,

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FOR HIS

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WITH

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Yields 12,500 cubic feet of 34-candle gas per ton, and 9 cwts. of excellent coke, containing only 4 per cent. of ash.

MUIRKIRK, No. 1, CANNEL

Yields 12,160 cubic feet of 32·5-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

OLD WEMYSS CANNEL

Yields 13,320 cubic feet of 32·5-candle gas per ton.

Prices and full Analyses on application.

GAS COAL.

POPE & PEARSON, LIMITED, have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles;* or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

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Established 1840.

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South Metropolitan Gaslight and Coke Company, London, July 12, 1878.

The Owners of the Dean's Primrose Colliery.

Dear Sirs,—I have much pleasure in stating that this Company have regularly used your Coals for more than thirty years, and that in all essential particulars they give the most satisfactory results.

The yield of Gas is from 9700 to 9800 feet per ton, of full 16 candles illuminating power, tested by the London Referees Standard Burner; and the Coke is of very good quality, while the quantity is about 40 bushels to the ton of Coal.

I consider Dean's Primrose Coals to rank amongst the first-class Gas Coals from the Durham Coal-Field.

Yours truly, GEORGE LIVESEY.

These Coals are also used by The Gaslight and Coke Company (London), and other English and Foreign Gas Companies.

Steamers loaded with quick despatch in the River Tyne. Price and other terms on application at the

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HOLMSIDE GAS COALS.

South Metropolitan Gaslight and Coke Company, 589, *Old Kent Road, London, S.E., Oct.* 9, 1873.

At the request of Mr. Hedley, the owner of the Holmside Colliery, I have much pleasure in stating that, for about ten or twelve years past, this Company has taken at least half of its supply of Newcastle Coal from him. I can, therefore, confidently bear testimony to the good quality of the Holmside Coals, and consider they are equal to the best of the Newcastle Coals, in proof of which I may state that this year we are using those Coals exclusively, that the yield of Gas is from 9700 to 9800 feet per ton, and that the quality of the Gas, without any admixture of Cannel, is over 16 candles, as tested by the officer appointed by the Metropolitan Board of Works, using the London Gas Referees test.

The Coke is of excellent quality, and in quantity amounts to about 40 bushels from a ton of Coal.

The annual consumption of Coal amounts to about 75,000 tons.

GEORGE LIVESEY, Engineer and Secretary.

P.S.—I am at this date, Feb. 15, 1875, still using H lmside Coals as largely as ever, and am quite as well pleased with them as when I gave the above certificate.

GEORGE LIVESEY.

We are this year, 1878, using 80,000 tons of Holmside Coal. GEORGE LIVESEY.

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A .Inegotiations respecting M. Brémond's patented process for preventing Deposits of

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AGENT FOR

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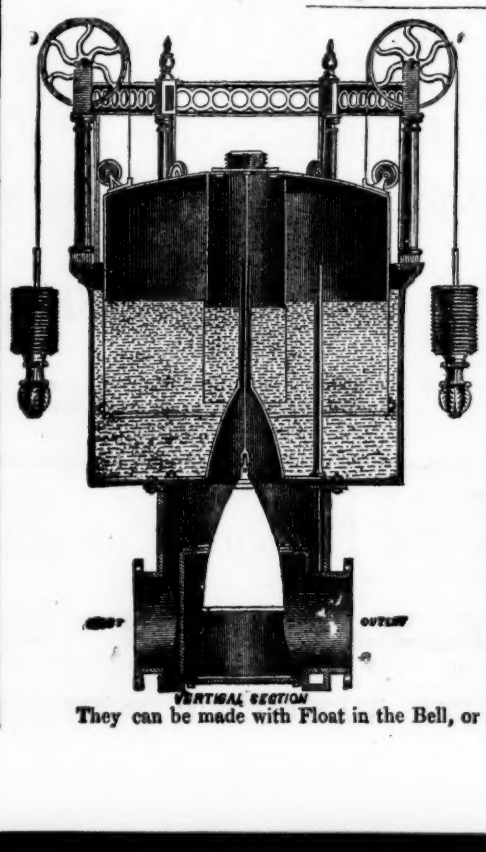

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The uniformity of pressure is obtained by introducing a compensating chamber into the Bell or Holder of the Governor, which compensator is of the same area as the valve, both of which are operated on by the initial pressure, thereby placing the valve in equilibrium, no matter what the initial pressure may be. The action on the Bell is by the Gas passing along a pipe from the outlet, and the pressure is regulated by weights in connexion with the Bell as required.

From the sectional elevation attached hereto, it will be seen that only the Gas required to operate the Bell comes in contact with the water of the tank, which water will remain comparatively sweet and free from odour. That in case of accident to the Bell, no more Gas can escape than would pass up the pipe covering the valve-rod and Bell supply-pipe.

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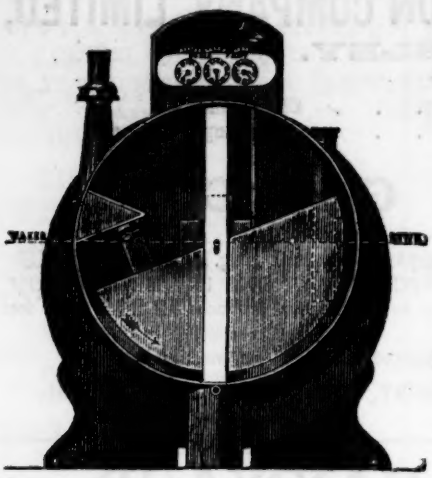

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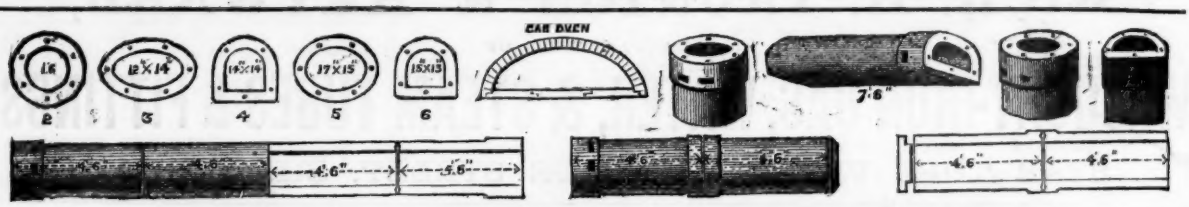

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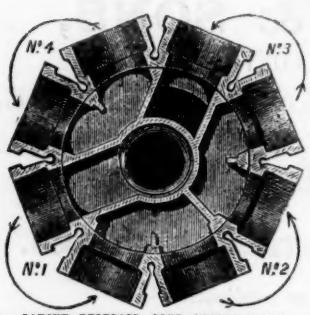

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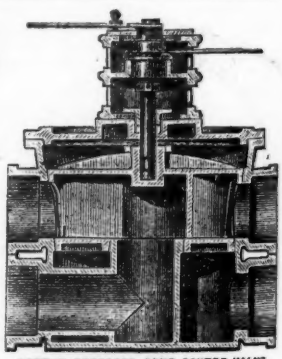

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